

"BIG BOY" FILTER SILENCERS

"FS" Series DN200-DN300 PN10 Pattern Flange

APPLICATIONS & EQUIPMENT

- Industrial & Severe Duty
- Blowers Side Channel & Roots
- Piston Compressors
- **Screw Compressors**
- · Hydraulic Breathers fine filtration
- Engines
- Fans
- Construction Industry
- Medical
- Pneumatic Conveying
- Waste Water Aeration
- Sparging
- Cement
- Power Plants
- Vacuum Vent Breathers

FEATURES & SPECIFICATIONS

- Tubular silencing design tube is positioned to maximize attenuation and air flow while minimizing pressure drop
- · Durable carbon steel construction with gray baked enamel finish
- · Low pressure drop center bracket and outlet pipe design
- 1/8" tap hole
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Several element sizes available per given connection (safety factor)
- · Interchangeable media: Polyester, Paper, HEPA
- Temp (continuous): min -26°C (-15°F) max 104°C (220°F)
- Filter change out differential: 255-380 mm H₂O over initial delta P
- · Pressure drop graphs available upon request

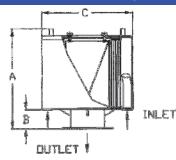
OPTIONS (Inquiries Encouraged)

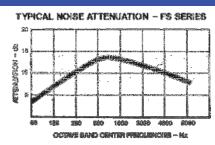
- Various media available
- Pressure Drop Indicator Epoxy coated housings
- · Available in Stainless Steel
- Custom connections, NPT
- Side Access QB Series Filters for space restricted enclosures (Selected models)

CONFIGURATION

DRAWING







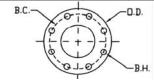
Noise attenuation may vary due to the wide range of applications and machines

I = Industrial Duty S = Severe Duty E = Extreme Duty

Dimension tolerance + 6 mm

	Ш.											
	Ш				Ra	ted Flow m	1 ³ /h					
	V	with	with		DIM	ENSIONS -	- mm		Screw,		No. of	i l
		Polyester	Paper	Flange					Blower,	Element	Silencing	Approx.
		Element	Element	Outlet	Α	В	С	Piston	Fan	Rating	Tubes	Wt. Kg
Г	Ι	FS-377P-DN200	FS-376P-DN200	DN200	584	152	572	2450	3060	3105	12	54
Т	S	FS-385P-DN200	FS-384P-DN200	DN200	584	152	724	2450	3060	5605	12	56
Т	Е	FS-485P-DN200	FS-484P-DN200	DN200	787	152	724	3060	3060	8000	12	62
Т	Ι	FS-385P-DN250	FS-384P-DN250	DN250	584	152	724	3060	5610	5610	16	59
	S	FS-485P-DN250	FS-484P-DN250	DN250	787	152	724	4420	5610	8000	16	64
П	Е	FS-685P-DN250	FS-384P(2)-DN250	DN250	965	152	724	4900	5610	11220	16	74
П	Ι	FS-385P-DN300	FS-384P-DN300	DN300	584	152	724	4420	5610	5610	24	61
Г	s	FS-485P-DN300	FS-484P-DN300	DN300	787	152	724	4420	7990	8000	24	70
	Е	FS-685P-DN300	FS-384P(2)-DN300	DN300	965	152	724	5950	7990	11220	24	79
	Е	FS-485P(2)-DN300	FS-484P(2)-DN300	DN300	1346	152	724	7345	7990	16000	24	88

PN10	DIMENSIONS - mm			No. of	Thickness
Pattern Flg	O.D.	B.C.	B.H.	Holes	Flg - mm
DN200	340	295	22	8	14
DN250	395	350	22	12	14
DN300	445	400	22	12	14



Note: Model offerings and design parameters may change without notice.

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Solberg - Discover the Possibilities E-mail: sales@solbergmfg.com • Web Site: www.solbergmfg.com F-44 B-301/2 - Blower, Elmo, 2BH7420-0AH267 2.4HP

Contents

1	Safety	y	3
	1.1	Definitions	3
		1.1.1 Safety alert symbol	3
		1.1.2 Signal words	3
	1.2	General safety precautions	
	1.3	Residual risks	6
2	Intend	ded Use	7
3	Techr	nical Data	8
	3.1	Mechanical data	8
	3.2	Electrical data	11
	3.3	Operating conditions	
4	Trans	port and Handling	12
5	Install	lation	13
	5.1	Installation	14
	5.2	Electrical connection (motor)	16
	5.3	Connecting pipes/hoses (vacuum pump/compressor)	18
		5.3.1 Inlet connection	19
		5.3.2 Discharge connection	19
		5.3.3 Procedure when connecting pipes/hoses	
6	Comn	nissioning	20
	6.1	Preparation	20
	6.2	Start-up and shut-down	22
	•	ation	
8	Shut-l	Down and Longer Standstills	22
	8.1	Preparing for shut-down or longer standstill	22
	8.2	Storage conditions	23
9	Servi	cing	23
	9.1	Repairs/troubleshooting	24
	9.2	Service/After-sales service	
	9.3	Decontamination and Declaration of Clearance	25
		sal	
11	Explo	sion-Protected Design	25
Eι	J decla	aration of conformity	26
Fo	rm for	statement on safety	27

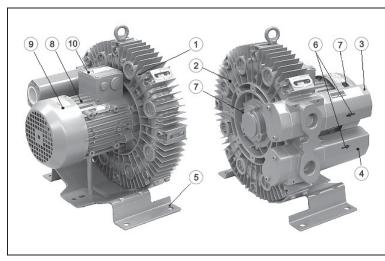


Fig. 1: Design of gas-ring vacuum pump/compressor

- Vacuum pump/compressor housing
- Vacuum pump/compressor cover
- Inlet connection with muffler
- Discharge connection with muffler
- 5 Base
- 6 Flow direction arrow
- 7 Rotating direction arrow
- 8 Drive motor
- 9 Fan guard (over external fan)
- 10 Terminal box

1 Safety

1.1 Definitions

To point out dangers and important information, the following signal words and symbols are used in these operating instructions:

1.1.1 Safety alert symbol

The **safety alert symbol** ⚠ is located in the safety precautions in the highlighted heading field on the left next to the signal word (DANGER, WARNING, CAUTION).

Safety precautions with a safety alert symbol indicate a danger of **injuries**.

Be sure to follow these safety precautions to protect against **injuries or death!**

Safety precautions **without** a safety alert symbol indicate a danger of **damage**.

1.1.2 Signal words

DANGER
The signal words are located in the safety precautions in the

WARNING highlighted heading field.

CAUTION They follow a certain hierarchy and

NOTICE indicate (in conjunction with the safety alert symbol, see

NOTE Chapter 1.1.1) the seriousness of

the danger and the type of

warning.

See the following explanations:

1.3 Residual risks

2 Intended Use

These operating instructions

- apply to gas-ring vacuum pumps/compressors of the G-BH7 series, models 2BH72, 2BH73, 2BH74, 2BH75 and 2BH76,
- contains instructions concerning transport and handling, installation, commissioning, operation, shut-down, storage, servicing and disposal of the G-BH7,
- must be completely read and understood by all operating and servicing personnel before beginning to work with or on the G-BH7,
- · must be strictly observed,
- must be available at the site of operation of the G-BH7.

About the operating and servicing personnel of the G-BH7

- These persons must be trained and authorized for the work to be carried out.
- Work on electrical installations may be carried out by trained and authorized electricians only.

The G-BH7s

- are pump-motor units for generating vacuum or gauge pressure;
- are used to extract, pump and compress the following gases:
 - Air
 - Non-flammable, non-aggressive, non-toxic and non-explosive gases or gas-air mixtures.
 - For differing gases/gas-air mixtures, inquire with the Service Department.
- are equipped with one of the following kind of drive motors:
 - 3-phase AC drive motor with a standard or explosion-protected design
 - Single-phase AC drive motor

These operating instructions apply **only to** pump-motor units with a **standard design**.

For the explosion-protected design

3 Technical Data

3.1 Mechanical data

Weight

Single-impeller design					
Model Weight		ight			
	[kg] approx.	[lbs] approx.			
2BH7210-01	16	35			
2BH7310-01	16	35			
2BH7310-02	17	38			
2BH7410-01	23	51			
2BH7510-01	26	57			
2BH7510-02	29	64			
2BH7610-01	32	71			
2BH7610-03	35	77			

Two-impeller design				
Model	Wei	ight		
	[kg] approx.	[lbs] approx.		
2BH7220-02	24	53		
2BH7220-05	28	62		
2BH7320-05	30	66		
2BH7420-02	33	73		
2BH7420-05	39	86		
2BH7520-02	40	88		
2BH7520-07	51	112		
2BH7620-03	48	106		
2BH7620-05	65	143		

Three-impeller design				
Model	Weight			
	[kg] approx.	[lbs] approx.		
2BH7530-08	68	150		
2BH7630-06	94	207		

Minimum distances

Minimum distance to fan guard (for sucking in cooling air):

Model	[mm] approx.	[inches] approx.
2BH72	34	1.34
2BH73	34	1.34
2BH74	52	2.05
2BH75	52	2.05
2BH76	53	2.09

Minimum distance to face of vacuum pump/compressor cover:

Model	[mm] approx.	[inches] approx.
2BH7	30	1.18

Vibrations

The following table provides information on the maximum permissible loading due to vibrations.

Model	Vibration velocity V _{eff}		
	[mm/s] ≤	[ft/s] ≤	
2BH72 2BH75	3.0	0.010	
2BH76	3.5	0.011	

Noise level

Measuring-surface sound-pressure level as per EN ISO 3744, measured at a distance of 1 m [3.28 ft] at an operating point of approximately 2/3 of the permissible total pressure difference with the lines connected without a vacuum or pressure relief valve, tolerance ±3 dB (A).

Single-impeller design					
Model	1-m measuring-surface sound pressure level L [dB (A)]				
	50 Hz	60 Hz			
2BH7210-01		70			
2BH7310-01		70			
2BH7310-02		70			
2BH7410-01	70	70			
2BH7510-01	70	70			
2BH7510-02		70			
2BH7610-01		71			
2BH7610-03		71			

Two-impeller desig	Two-impeller design					
Model	1-m measuring-surface sound pressure level L [dB (A)]					
	50 Hz	60 Hz				
2BH7220-02		70				
2BH7220-05		70				
2BH7320-05		70				
2BH7420-02		70				
2BH7420-05	70	70				
2BH7520-02		70				
2BH7520-07		71				
2BH7620-03		71				
2BH7620-05		72				

Three-impeller design				
Model	1-m measuring-surface sound pressure level L [dB (A)]			
	50 Hz	60 Hz		
2BH7530-08	67	73		
2BH7630-06	77	80		

Temperature increase

The information listed in the following tables corresponds to the heating of vacuum pump/compressor housings and the air exiting compared to the ambient temperature during operation with a permissible total pressure difference and an air pressure of **1,013 mbar** [14.7 psi]. At lower air pressures these values increase.

Single-impeller design				
Model	Ten	nperatu	re incre	ase
	∆T [K] approx.		∆ϑ [F] approx.	
	50 Hz	60 Hz	50 Hz	60 Hz
2BH7210-01	52	61	94	110
2BH7310-01	61	61	110	110
2BH7310-02	81	86	146	155
2BH7410-01	90	101	162	182
2BH7510-01	93	111	167	200
2BH7510-02	120	112	216	202
2BH7610-01	118	124	212	223
2BH7610-03	118	124	212	223

Two-impeller design				
Model	Temperature increase			ase
	∆T app		$\Delta \vartheta$ [F] approx.	
	50 Hz	60 Hz	50 Hz	60 Hz
2BH7220-02	55	77	99	139
2BH7220-05	74	110	133	198
2BH7320-05	81	124	146	223
2BH7420-02	89	80	160	144
2BH7420-05	121	117	218	211
2BH7520-02	89	102	160	184
2BH7520-07	125	110	225	198
2BH7620-03	124	126	223	227
2BH7620-05	124	128	223	230

Three-impeller design				
Model	Temperature increase			ase
	∆T [K] approx.		∆9 [F] approx.	
	50 Hz	60 Hz	50 Hz	60 Hz
2BH7530-08	120	120	216	216
2BH7630-06	120	120	216	216

Tightening torques for screw connections

The following values apply if no other information is available.

With non-electrical connections, property classes of 8.8 and 8 or higher as per ISO 898-1 are assumed.

3.2 Electrical data

See rating plate.

3.3 Operating conditions

Temperatures

Temperature of pumped gases:	max. permissible temperature:		
pumped gases.	+40°C	[+104°F]	
	Nominal value:		
	+15°C	[+59°F]	
	Pump-motor unit temperatures on	•	
Ambient	max. permissible temperature:		
temperature (standard	+40°C	[+104°F]	
design) ¹ :	min. permissible temperature:		
	-15°C	[+5°F]	
	Nominal value:		
	+25°C	[+77°F]	
	Ambient temperatures betwee 25°C [+77°F] and 40°C [+104° affect the permissible total pressure difference (see Section "Permissible total pressure difference").		
	At higher temperatures the winding may be damaged and the grease change interval may be shortened.		

Pressures

Min. inlet pressure:	See rating plate.
Max. discharge pressure during compressor operation:	See rating plate.
Max. permissible pressure in pump-motor unit:	2.5 bar abs. [36.2 psia] At this pressure the operation of the pump-motor unit may be considerably impaired. Provide a corresponding protective device (e.g. pressure relief valve) if necessary.
Permissible total pressure difference:	The total pressure difference specified on the rating plate only applies under the following conditions:
	 Ambient temperature: 25°C [77°F].
	 Inlet temperature (temperature of pumped gases at inlet connection): 15°C [59°F].
	 Pressure: during vacuum-pump operation: 1,013 mbar [14.7 psia] at discharge connection;
	during compressor operation: 1,013 mbar [14.7 psia] at inlet connection;
	At an ambient temperature of 40°C [104°F] the total pressure difference specified on the rating plate must be reduced by 10%.
	If the ambient temperature is between 25°C [77°F] and 40°C [104°F], then the total pressure difference specified on the rating plate must be reduced linearly to the temperature by between 0 and 10 %.

Installation altitude

Max. of **1,000 m** [3,280 ft] above sea level.

When installing the pump-motor unit at an altitude of more than **1,000 m** [3,280 ft] above sea level, first inquire with the Service department.

¹ For design with frequency converter, see separate operating instructions.

4 Transport and Handling

5 Installation

The pump-motor unit is ready to connect on delivery.

However, if the time from delivery to commissioning of the pump-motor unit exceeds a certain period, the lubrication of the rolling bearings must be renewed.

See Chapter 8.2, "Storage conditions",
Section "Lubrication of rolling bearings after longer storage", Pg. 23 for information on this topic.

Carry out the following work to install the pumpmotor unit:

- · Installation and securing,
- Attachment of the included loose muffler if necessary,
- Attachment of threaded flange or hose flange (available as accessories) for the connection of inlet or discharge pipe to the muffler,
- Electrical connection,
- Connection of inlet and discharge connection to the system.

5.1 Installation

Components for reducing noise on the pumpmotor unit:

- Mufflers (included as standard equipment):
 On delivery the pump-motor units are equipped with attached mufflers as standard.
 The noise radiation is considerably reduced by the mufflers. See Fig. 2 to Fig. 4, Pg. 18 ff.
- Additional mufflers (available as an option):
 The additional mufflers enable a further noise reduction. They may only be used with free entry and exit of gases, i.e. with direct intake out of or direct feeding into the atmosphere without piping.
- Noise protection hoods (available as an option):

Noise protection hoods are suitable for installation in rooms and in the open. They reduce both the total sound pressure level and tonal components that are perceived as particularly annoying.

Installation variants/axis position:

Basically, when installing the pump-motor unit, the following variants are possible with a different axis position (horizontal or vertical):

- Horizontal installation
- Vertical installation on the vacuum pump/compressor cover ("cover installation")
- Vertical mounting on the wall.

Basically, all variants are possible with all models.

However, a distinction must be made between a design with and a design without a **condensed** water opening for the axis position:

- The pump-motor units without a condensed water opening can be installed and secured in any axis position.
- The pump-motor unit with a condensed water opening may only be installed and secured horizontally with the base at the bottom.

Horizontal installation

Screw the base of the pump-motor unit to the surface with suitable mounting elements.

Proceed as follows:

- Provide the base of the pump-motor unit with mounting holes.
- Select the suitable screw type.
- Screw the base of the pump-motor unit to the surface with the screws.
 When doing so, be sure to provide all mounting holes with screws!

Vertical installation on the vacuum pump/compressor cover ("cover installation")

With vertical installation of the pump-motor unit with the vacuum pump/compressor cover facing downward, rubber feet must be used.

Proceed as follows:

- The rubber feet are available as accessories.
 They are delivered in a set of 3.
 On the upper section they are provided with stud bolts and on the lower section with a threaded hole.
- Mount the rubber feet on the pump-motor unit: Screw the stud bolts of the rubber feed into the holes on the face of the vacuum pump/compressor cover and tighten them.
- Mount the pump-motor unit together with the rubber feet on the installation surface: Select suitable mounting elements for the threaded hole.
 - Screw the rubber feet to the surface or foundation via the threaded hole.

Vertical mounting on the wall

With vertical mounting of the pump-motor unit on the wall, the pump-motor unit is mounted via the holes in the base.

Proceed as follows:

- Position the pump-motor unit as close to the wall as possible on a stable supporting plate with sufficient load-bearing capacity.
 The pump-motor unit must be positioned with the base toward the wall.
- Provide the base of the pump-motor unit with mounting holes.
- Select the suitable screw type.
- Screw the base of the pump-motor unit to the wall with the screws.
 When doing so, be sure to provide all mounting holes with screws!
- Remove the supporting plate.

Eye bolt:

Following installation, the eye bolt must be either firmly tightened or removed.

5.2 Electrical connection (motor)

- For the tightening torques for terminal board connections (except terminal strips), see Chapter 3.1, "Mechanical data", Section "Tightening torques for screw connections", Pg. 10.
- For terminals with clamping straps (e.g. as per DIN 46282), the conductors must be inserted so that approximately the same clamping height results on both sides of the bar. Individual conductors must therefore be bent into a U-shape or connected with a cable lug (DIN 46234).

This also applies to:

- the protective conductor,
- the outer ground conductor.

Both conductors can be recognized from their color (green/yellow).

5.3 Connecting pipes/hoses (vacuum pump/compressor)

Mufflers:

The pump-motor units are delivered with mufflers (indicated with arrows in the following illustrations) for the inlet and discharge connections as standard equipment.

With **single-impeller pump-motor units**, the mufflers are already mounted on delivery.

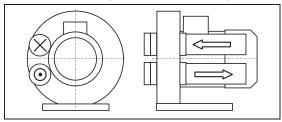


Fig. 2: 2BH721 ... 2BH761 (single-impeller pumpmotor units)

With **two-impeller and three-impeller pump-motor units**, the inlet-side muffler is included loose for packaging-related reasons and must be mounted by the operator.

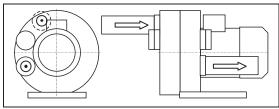


Fig. 3: 2BH722 ... 2BH762 (two-impeller pumpmotor units with two-stage design)

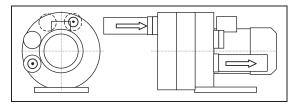


Fig. 4: 2BH723 ... 2BH763 (three-impeller pumpmotor units with three-stage design)

6 Commissioning

6.2 Start-up and shut-down

Start-up

- Open shut-off device in intake/discharge pipe.
- Switch on power supply for drive motor.

Shut-down:

- Switch off power supply for drive motor.
- Close shut-off device in intake/discharge pipe.

7 Operation

• Provide mufflers on inlet and discharge side with sealing plugs.

8.2 Storage conditions

To prevent standstill damage during storage, the environment must provide the following conditions:

- dry,
- · dust-free,
- low-vibration (effective value of vibration speed v_{eff} ≤ 2.8 mm/s).
- Ambient temperature: max. +40°C [+104°F].

9.1 Repairs/troubleshooting

Fault	Cause	Remedy	Carried out by
Motor does not start; no motor noise.	At least two power supply leads interrupted.	Eliminate interruption by fuses, terminals or power supply cables.	Electrician
start; humming	One power supply lead interrupted.	Eliminate interruption by fuses, terminals or power supply cables.	Electrician
noise.	Impeller is jammed.	Open vacuum pump/compressor cover, remove foreign body, clean.	Service*)
		Check or correct impeller gap setting if necessary.	Service
	Impeller defective.	Replace impeller.	Service*)
	Rolling bearing on drive motor side or vacuum pump/compressor side defective.	Replace motor bearing or vacuum pump/compressor bearing.	Service*)
Protective	Winding short-circuit.	Have winding checked.	Electrician
motor switch trips when	Motor overloaded. Throttling	Reduce throttling.	Service*)
motor is switched on. Power	does not match specification on rating plate.	Clean filters, mufflers and connection pipes if necessary.	Service*)
consumption too high.	Compressor is jammed.	See fault: "Motor does not start; humming noise" with cause: "Impeller is jammed.".	Service*)
Pump-motor	Leak in system.	Seal leak in the system.	Operator
unit does not generate any or generates	Wrong direction of rotation.	Reverse direction of rotation by interchanging two connecting leads.	Electrician
insufficient pressure difference.	Incorrect frequency (on pump-motor units with frequency converter).	Correct frequency.	Electrician
	Shaft seal defective.	Replace shaft seal.	Service*)
	Different density of pumped gas.	Take conversion of pressure values into account. Inquire with Service Department.	Service
	Change in blade profile due to soiling.	Clean impeller, check for wear and replace if necessary.	Service*)
Abnormal flow noises.	Flow speed too high.	Clean pipes. Use pipe with larger cross- section if necessary.	Operator
	Muffler soiled.	Clean muffler inserts, check condition and replace if necessary.	Service*)
Abnormal running noise.	Ball bearing lacking grease or defective.	Regrease or replace ball bearing.	Service*)
Compressor leaky.	Seals on muffler defective.	Check muffler seals and replace if necessary.	Service*)
	Seals in motor area defective.	Check motor seals and replace if necessary.	Service

^{*)} Only when the maintenance manual is at hand: rectification by the operator.

9.2 Service/After-sales service

Our Service is available for work (in particular the installation of spare parts, as well as maintenance and repair work), not described in these operating instruction.

A list of spare parts with an exploded drawing is available on the Internet at www.gd-elmorietschle.com.

Observe the following when **returning** pumpmotor unit:

- The pump-motor unit must be delivered complete, i.e. not dismantled.
- The pump-motor unit may not present a danger to the workshop personnel.
 If the pump-motor unit has come into contact with dangerous substances, then the procedure described in Chapter 9.3,
 "Decontamination and Declaration of Clearance", Pg. 25, must be used.
- The original rating plate of the pump-motor unit must be properly mounted, intact and legible.
 All warranty claims are voided for pump-motor units delivered for a damage expertise without the original rating plate or with a destroyed original rating plate.
- In case of warranty claims, the manufacturer must be informed of the operating conditions, operating duration etc. and additional detailed information provided on request if necessary.

9.3 Decontamination and Declaration of Clearance



EU declaration of conformity

Manufacturer: Gardner Denver Deutschland GmbH

Industriestraße 26

97616 Bad Neustadt • Germany

Representative for the compilation of technical docuHolger Krause Industriestraße 26

ments:

97616 Bad Neustadt • Germany

Description and identification of the machine:

Vacuum pumps/Compressors (Side channel blower)

G-BH7 Series

Types

2BH72..-....-. 2BH73..-....-. 2BH74..-....-. 2BH75..-....-.

2BH76..-....-.

The machine described above meets the following applicable Community harmonisation legislation:

2006/42/EC European Parliament and Council Directive 2006/42/EC from 17th May 2006 on machinery

and amending Directive 95/16/EC.

2004/108/EC*) Directive 2004/108/EC of the European Parliament and Council from 15th December 2004

for the application of the legal regulations of the EU member states concerning electrical

devices and repealing Directive 89/336/EEC

Harmonised standards applied:

EN 1012-1:2010 Compressors and vacuum pumps - Safety requirements - Part 1: Compressors

EN 1012-2:1996

+A1:2009

Compressors and vacuum pumps - Safety requirements - Part 2: Vacuum pumps

EN ISO 12100:2010

Safety of machinery - General principles for design -Risk assessment and risk reduction (ISO 12100:2010)

EN 60204-1:2006

Safety of machinery - Electrical equipment of machines Part 1:

General requirements IEC 60204-1:2005 (amended)

EN 60034-1:2010/

Rotating electrical machines - Part 1:

AC:2010

Rating and performance IEC 60034-1:2010 (amended)

Bad Neustadt, 18.04.2012 (Place and date of issue)

> Andreas Bernklau, product management/attorney (Name and function)

Only applicable for version with frequency converter 2FC

Dr. Rudi Dittmar, development (Name and function)

664.44436.40.000



Statement on health safety and on the protection of the environment

- For the safety of our employees and to comply with statutory requirements on handling substances harmful to the health and the environment, this statement must be enclosed, fully completed, with **each** unit/system sent.
- Without the fully completed statement, repair/disposal is not possible and delays are unavoidable!
- The statement is to be completed and signed by suitably qualified, authorised personnel at the operating organisation.
- In the case of shipment to Germany, the statement is to be completed in German or English.
- The statement is to be attached to the outside of the packing on shipment.

If necessary, the carrie	er is to be informed.			
I. Product designation (t	ype):			
2. Serial number (no. BN): 			
B. Reason for sending:				
	ontact with hazardous substances. tinue with "6. Legally binding staten		for personnel or the env	ironment during
has come into contac	ct with hazardous substances. Con	tinue with "5. Information	on the contamination"	
5. Information on the cor The unit/system was use	ntamination ed in the following application:	(if necessary prov	vide more information or	ı an additional sheet)
and has come into conta	act with the following classifiable su	ubstances or substances p	presenting a hazard to he	ealth/environment:
Trade name:	Chemical designation:	Hazardous substance class:	Properties (e.g. toxic, caustic, radioactive):	inflammable,
Š	n accordance with the applicable re		sheet). tive equipment):	
so. We are aware that we a obliged to indemnify the	at the details specified are true and re liable to the contractor for any de contractor against claims for dama spective of this statement, we are d	amages arising from incon ages by third parties arisin	nplete or incorrect speci g from incomplete or inc	fications. We are correct specifications.
Company/institute:				
Name, position:		Phone:		
Street:		Fax:		
Post code, city:				
Country:		Stamn:		
Date, signature:				
Gardner Denver Deutschland	d GmbH			610.44436.40.000
P.O. box 1510	Phone: +49 7622 392 0	E-mail: er.de@gardnerden	nver.com	Edition: 04.2012
7605 Bad Neustadt	Fax: +49 7622 392 300	Internet: www.gd-elmorietso	chle.com	English



Pression & Vide • Pressure & Vacuum

B-501/2 - Blower, Sutorbilt, Model 4L-RHC, Orientation: Horizontal (Flow Down) Driven Shaft Position: RHC (Right Hand Central) Flow Requirement: 487 scfm

OPERATION & MAINTENANCE MANUAL

AIRCOM PACKAGE

WITH

SUTORBILT

POSITIVE DISPLACEMENT BLOWER

YOUR REFERENCE: PO # 1704432-0008 (Blower) & 1704432-0009 (Package)

OUR REFERENCE: 222850 & 222851





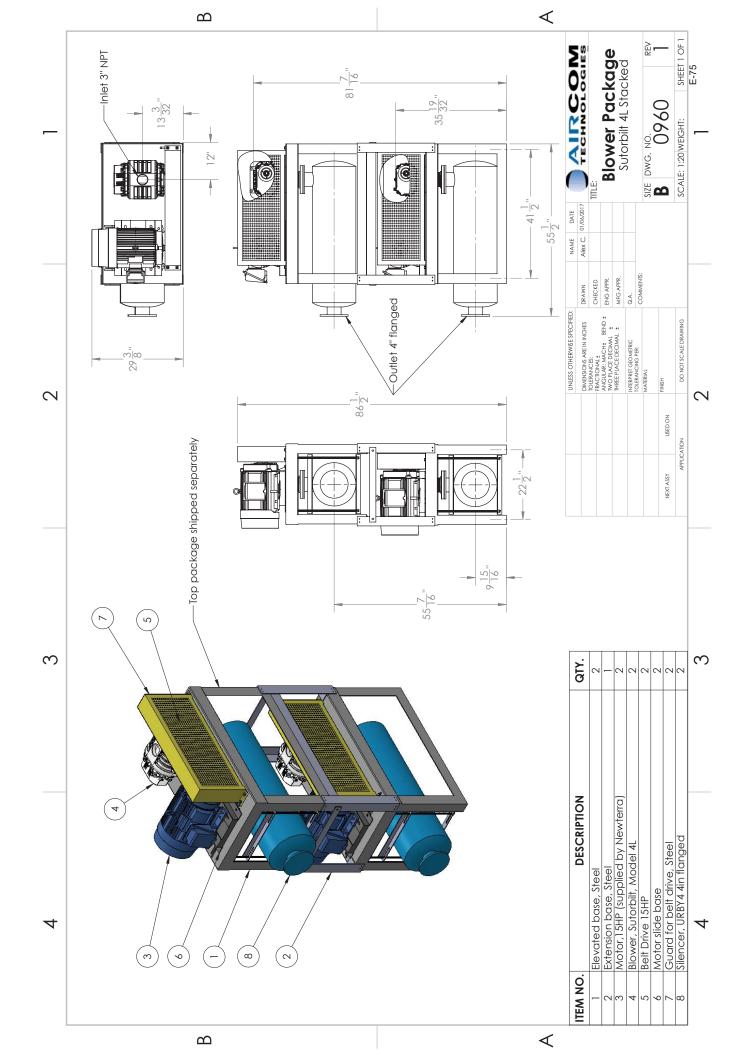






TABLE OF CONTENTS

	ITEM
Package drawing(s) including scope of supply	1
Drive (belt or coupling) data sheet(s)	2
Blower performance data sheet(s)	3
Motor manual(s) / data sheet(s)	4
Gardner Denver blower parts list, operating and service manual	5
Maintenance data sheet – Spare parts list	6





Selection Parameters Shaft diameter Driver: 1-5/8 Inch Family: Classic & Narrow belts drives

Max. Hub Load: 9999 Rim Speed min.: 900 FPM Rim Speed max.: 6500 FPM Pitch Diameter (Inch) Min. Max.
Driver 0.50 71.00
Driven 0.50 71.00 Nbr of Grooves min.: 1 Nbr of Grooves max.: 15

Rpm Driver: 3525 Rpm Driven: 3364 Tolerance: +3%

Center distance : Minimum: 23.5 Inch Maximum: 24.5 Inch Belts: A,AX,B,BX,C,CX,3V,3VX,5V,5VX,8V

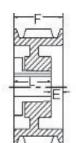
Shaft diameter Driven: 7/8 Inch Service Factor: 1.4

Driver power: 13.3 hp

Actual Drive Values

Maximum number of results: 20

Rpm: 3417 Center distance (Inch): 23.6 Deflection (inch): 0.37 Service Factor: 1.55 Power/Belt (hp): 10.3 Deflection Force (lbs): 3.1 BeltSpeed (fpm): 5859 List Price: 194.90 Hub Loads (lbs): 130



Driver Sheave: 2B64

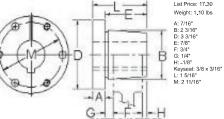
Constuction type: Web

List Price: 68.00 Weight: 7.35 lbs D.D. A or 4L Belt: 6.00" D.D. B or 5L Belt: 6.40" E: 7/16" F: 1 3/4" L: 1 5/16" O.D.: 6.75"

Driver Bushing: SDSX1-5/8

List Price: 17.30 Weight: 1.10 lbs

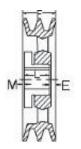
Set screw - Dimensions: 1/4-20 UNC x 1/4
Product specifications: Standard with set screw over keyway,
Hex bolt: 3=1/4-20 UNC x 1-3/8



Driven Sheave: 2MBL69 Constuction type: Arms

List Price: 64.60 Weight: 6.55 lbs

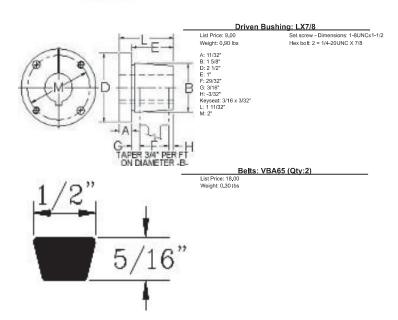
D.D. A or 4L Belt: 6.2" D.D. B or 5L Belt: 6.6" E: 1/16" F: 1 3/4" L: 1 11/32" O.D.: 6.95"



06/07/2017

Page 1 of 2





Recommended Drive Selections are designed for use with Markia components (shawes, bushings and Vizidijahnch meet or exceed MPTA & RMA dandards. The use of lesser quality products could affect the expectancy of drive Selections and Prising are as occurate as possible, Markia is not responsible for XVIV prising or design errors, Price shows are for standard products only, for non-standard products or products that need dynamic balancing, constact Markia for prising.



Sutorbilt Legend - 4L

Product Information

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	100 ALTI-FT	14.642 PSIA	1.01 bar a
Elevation	100 ALTI-FT	100 ALTI-FT	30 alti-m
Inlet Pressure	14.642 PSIA	0.000 PSIG	0 bar g
Inlet Pressure Loss	0.3 PSIG	0.300 PSIG	0.021 bar g
Inlet Temp	68 F	68 °F	20 °C
Inlet Flow	487 SCFM	499 ICFM	848 m³/h
Discharge Pressure	4.4 PSIG	4.400 PSIG	0.303 bar g
Discharge Pressure Loss	0.2 PSIG	0.200 PSIG	0.014 bar g
MEA SURED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Speed	3364 RPM	3364 RPM	3364 RPM
RPM % Of Max	93	93	93
Power	13.3 HP	13.3 HP	9.9 kW
Discharge Temp	126 °F	126 °F	52 °C
Temp % of Max	48	48	48
Noise	88 dBa	88 dBa	88 dBa
Pressure % of Max	70	70	70



PHYSICAL	
Weight	155 lbs.
Gear Diameter / Center Distance	4 in.
Connection Size	3i/3d in.
Case Length	8 in.
WR ²	0.924 lb- ft ²
Orientation	horizonta
PERFORMANCE	
Max Delta P	7 PSI
	7 PSI 260 °F
Max Delta P	
Max Delta P Max Temp	260 °F
Max Delta P Max Temp Max Speed	260 °F 3600 RPM

E-78



AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.866 lbm/lbmol	28.866 kg/kgmol
R Value	53.523 ft.lbf/lbm.R	0.288 kJ/kg.K
Density	0.075 lbm/ft ³	1.196 kg/m ³

831-850 VS-124	Contract of
Air	100%







Gardner Denver



PARTS LIST OPERATING AND SERVICE MANUAL

LEGEND
"R" SERIES
BLOWERS

3" - 5" GEAR DIAMETER

Models
GAB__R_
GAC__R_
GAE__R_



SB-7-632 Version 05 July 8, 2015

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER PARTS AND SUPPORT SERVICES

Factory genuine parts, manufactured to design tolerances, are developed for optimum dependability - - - specifically for your blower. Design and material innovations are born from years of experience with hundreds of different blower applications. When you specify factory genuine parts you are assured of receiving parts that incorporate the most current design advancements manufactured in our state-of-the-art blower factory under exacting quality standards.

Your AUTHORIZED DISTRIBUTOR offers all the backup you require. A worldwide network of authorized distributors provides the finest product support in the blower industry.

- 1. Trained technical representatives to assist you in selecting the correct replacement parts.
- 2. Complete inventory of new machines and new, genuine factory parts.
- 3. A full line of factory tested AEON® PD blower lubricants, specifically formulated for optimum performance in all blowers.
- 4. Authorized distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair service.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

- 1. Face the blower drive shaft.
- 2. In a **VERTICAL** configuration, air flow is horizontal.
- 3. In a **HORIZONTAL** configuration, air flow is vertical.
- 4. In a vertical configuration, a **BOTTOM HAND** exists when the drive shaft is below the horizontal center line of the blower. A **TOP HAND** exits when the drive shaft is above the horizontal center line of the blower.
- 5. In a horizontal configuration, a **RIGHT HAND** exists when the drive shaft is to the right of the vertical center line of the blower. A **LEFT HAND** exists when the drive shaft is to the left of the vertical center line of the blower.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

For pricing, and ordering information contact your nearest AUTHORIZED FACTORY DISTRIBUTOR. When ordering parts, specify Blower **MODEL** and **SERIAL NUMBER** (see nameplate on unit).

Rely upon the knowledge and experience of your AUTHORIZED DISTRIBUTOR and let them assist you in making the proper parts selection for your blower.

To Contact Gardner Denver or locate your local distributor: Visit: www.contactgd.com/mobile

Or

Call: (217)222-5400

GARDNER DENVER LUBRICANT ORDER INFORMATION

Re-order Part Numbers for Factory Recommended Lubricants.

Gear and Drive End

AEON PD Synthetic Lubricant, AEON PD-XP—Extreme Duty Synthetic Lubricant or AEON PD-FG—Food Grade Synthetic Lubricant

AEON PD Synthetic Lubricant

<u>Description</u>	Part Number
1 Quart	28G23
Case/12Quarts	28G24
1 Gallon Container	28G40
Case/6 Gallons	28G41
5 Gallon Pail	28G25
55 Gallon Drum	28G28

AEON PD-XD – Extreme Duty Synthetic Lubricant

<u>Description</u>	Part Number
1 Quart	28G46
Case/12Quarts	28G47
1 Gallon Container	28G42
Case/6 Gallons	28G43
5 Gallon Pail	28G44
55 Gallon Drum	28G45

AEON PD-FG – Food Grade Synthetic Lubricant

<u>Description</u>	Part Number
1 Quart	28H97
Case/12Quarts	28H98
1 Gallon Container	28H333
Case/6 Gallons	28H334
5 Gallon Pail	28H99
55 Gallon Drum	28H100

Drive End

AEON PD Grease

<u>Description</u>	Part Number
Case/10 Tubes (14oz/Tube	28H283

Call your local Gardner Denver Distributor to place your order for Gardner Denver lubricants. Your Authorized Gardner Denver Distributor is:

FOREWORD

Sutorbilt® blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This manual is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

A DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

MWARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

⚠ CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

▲ DANGER

Failure to observe these notices could result in injury to or death of personnel.

- Keep fingers and clothing away from revolving fan, drive coupling, etc.
- <u>Do not use the air discharge</u> from this unit for breathing not suitable for human consumption.
- <u>Do not loosen or remove</u> the oil filler plug, drain plugs, covers or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.
- Electrical shock can and may be fatal.
- <u>Blower unit must be grounded</u> in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.
- Open main disconnect switch, tag and lockout before working on the control.
- <u>Disconnect the blower</u> from its power source, tag and lockout before working on the unit this machine may be automatically controlled and may start at any time.

WARNING

Failure to observe these notices could result in damage to equipment.

- Stop the unit if any repairs or adjustments on or around the blower are required.
- <u>Disconnect the blower</u> from its power source, tag and lockout before working on the unit this machine maybe automatically controlled and may start at any time.
- Do not exceed the rated maximum speed shown on the nameplate.
- <u>Do not operate unit</u> if safety devices are not operating properly. Check periodically. Never bypass safety devices.

TABLE OF CONTENTS

Maintain Blower Reliability And Performance	2
Foreword	4
Safety Precautions	5
Sutorbilt Legend Series Blowers Matrix/Menu	8
Introduction	9
Section 1, Equipment Check	10
Section 2, Installation	12
Section 3, Lubrication	17
Section 4, Operation	22
Section 5, Special Tools Required	25
Section 6, Disassembly Instructions	27
Section 7, Assembly Instructions	31
Section 8 Parts List	39 thru 62

INDEX

Aeon PD Extreme Duty Lubricant	20	Mechanical Seals Only	
Aeon PD Food Grade Lubricant		Mounting Configurations	12
Aeon PD Synthetic Lubricant			
Air Filters And Filter Silencers		Operation, Section 4	22
Assembly Instructions, Section 7	31	D + 1: + 0 +: 0	00
Dlawar Ctartus Charlet	00	Parts List, Section 8	
Blower Startup Checklist	23	Piping	14
Disassembly Instructions, Section 6	27	Recommended Lubricant	20
Drive End Lubrication	18	Removing Protective Materials	
Drive Installation		Repositioning The Mounting Feet	
DITTO ITIOCALICATION	10	Tropoolius mily The Mountaing Foot	
Equipment Check, Section 1	10	Safety Precautions	5
		Safety Precautions	
Foundations	12	•	
		Section 7	
Gear End Lubrication	18	Assembly Instructions	
		Setting Impeller End Clearance With Mechan	
Installation, Section 2	12	Setting Impeller End Clearances	34
Installing The Timing Gears	36		
Introduction	9	Special Tools Required Section 5	25
		Storage	
Limitations	22		
Location	12	Trouble Shooting	24
Lubrication, Section 3	17	Warranty	63
LIST FIGURE 2-1 – BLOWER MOUNTING CONFIGU FIGURE 2-2 – BELT DRIVE OVERHUNG LOAD			
FIGURE 3-1 - LUBRICATIONFIGURE 3-2 – APPROXIMATE OIL CAPACITIES			
FIGURE 3-3 – APPROXIMATE OIL CAPACITIES FIGURE 3-3 – AEON PD SYNTHETIC LUBRICA			
FIGURE 3-4 – SYNTHETIC LUBRICANT CHAR			
FIGURE 3-5 – LUBRICATION RECOMMENDAT	1 1∩N		20
FIGURE 4-1 – MAXIMUM / MINIMUM OPERATI	NG LIMITA	TIONS	22
FIGURE 5-1 – PULLER PLATE			25
FIGURE 5-2 – SEAL DRIVE			
FIGURE 5-3 - MECHANICAL SEAL INSTALLAT	ION TOOL.		26
FIGURE 5-4 - BEARING PRESS TOOL - MECH	HANICAL SI	EAL UNITS	26
FIGURE 6-1 – DISASSEMBLY ILLUSTRATIONS	2		27
FIGURE 6-2 – DISASSEMBLY ILLUSTRATIONS			
FIGURE 6-2 – DISASSEMBLY ILLUSTRATIONS FIGURE 6-3 – DISASSEMBLY ILLUSTRATIONS			
FIGURE 6-4 – DISASSEMBLY ILLUSTRATIONS			
FIGURE 6-5 – DISASSEMBLY ILLUSTRATIONS			
FIGURE 6-6 – DISASSEMBLY ILLUSTRATIONS			
FIGURE 7-1 – ASSEMBLY ILLUSTRATIONS			
FIGURE 7-2 – ASSEMBLY ILLUSTRATIONS			
FIGURE 7-3 – ASSEMBLY ILLUSTRATIONS			
FIGURE 7-4 - ASSEMBLY ILLUSTRATIONS			
FIGURE 7-5 – ASSEMBLY ILLUSTRATIONS			
FIGURE 7-6 - ASSEMBLY ILLUSTRATIONS			
FIGURE 7-7 – ASSEMBLY ILLUSTRATIONS			34
FIGURE 7-8 - ASSEMBLY ILLUSTRATIONS			37
FIGURE 7-9 – TORQUE FT LBS			38

SUTORBILT LEGEND SERIES BLOWERS MATRIX/MENU

Your blowe		d the construction options for LANCE OF LETTERS OR	G	Α			R	
FOLLOW SPACE T	THE LINE DOWN AND HUS FILLED IN TO FIN LUCTION OPTION WITH	COLUMN NUMBER:	1	2	3 4	5	6	7
COLUMN	I 1 – BASIC DESIGNAT	OR —						
COLUMN	I 2 – PRODUCT FAMIL'	Υ ————————————————————————————————————						
COLUMN	I 3 – GEAR DIAMETER				_			
	B 3" C 4"	E 5"						
COLUMN	I 4 – CASE LENGTH —							
	L - Low Pres	sure						
	M - Medium F H - High Pres							
A Vert B Vert C Hori	I 5 – CONFIGURATION cical-Top Hand -Central cical-Bottom Hand – Cer izontal – Left Hand – Ce izontal – Right Hand – C	Timed ntral Timed entral Timed				l		
COLUMN	I 6 – DESIGN VERSION	1 —————————————————————————————————————						
COLUMN	I 7 – ADDITIONAL DES	CRIPTION —						
A. L B. M C. L D. L E. M F. L	SEALS Lip Mechanical Lip Lip Mechanical Lip Mechanical Lip Mechanical	CLEARANCES Standard Standard High Temperature Standard Standard High Temperature High Temperature		Gre Gre Dua Dua Dua	BRICAT ase-Sp ase-Sp ase-Sp al-Splas al-Splas	lash lash lash sh sh		

INTRODUCTION YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in Gardner Denver quality. The Gardner Denver reputation for rugged dependability has been earned by over 50 years of service in demanding, industrial operations where downtime cannot be tolerated and efficient blower performance is expected.

Your Gardner Denver Sutorbilt blower is a precision engineered blower that has been carefully manufactured and thoroughly tested at the state-of the art Gardner Denver Blower Factory in Sedalia, Missouri.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to assure optimum blower performance. There is no guesswork in the manufacture of your highly advanced Sutorbilt blower and there must be none in preparing the blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Sutorbilt blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions for installing your blower. Follow the instructions carefully and you will be rewarded with trouble-free Gardner Denver Sutorbilt service year in and year out.

SECTION 1 EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all the parts have been received. All accessories are listed as separate items on the packing slip, and small important accessories such as relief valves can be overlooked or lost. After every item on the packing slip has been checked off, uncrate carefully.

NOTICE

Register a claim with the carrier for lost or damaged equipment.



Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in installation and operation of this equipment in the system or facility.

STORAGE

Your Gardner Denver Blower was packaged at the factory with adequate protection to permit normal storage for up to six (6) months.

If the unit is to be stored under adverse conditions or for extended periods of time, the following additional measures should be taken to prevent damage.

- 1. Store the blower in a clean, dry, heated (if possible) area.
- 2. Make certain inlet and discharge air ports are tightly covered to prevent foreign material from entering the air box.
- 3. All exposed, non-painted surfaces should be protected against rust and corrosion.
- 4. Provide adequate protection to avoid accidental mechanical damage.
- 5. In high humidity or corrosive environments, additional measures may be required to prevent rusting of the blower internal surfaces.
- 6. To prevent rusting of gears, bearings, etc., the oil reservoirs may be filled with normal operating oil.



Before running the blower, drain the oil and replace to the proper operating level with clean, fresh lubricant.

- 7. Rotate the blower shaft (10 to 25 turns) weekly during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust inhibitor if needed.
- 8. For long term storage (over six (6) months), contact Gardner Denver Compressor Division Customer Service for recommendations.

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with rust inhibitor which can be removed with any standard solvent.



Follow the safety directions of the solvent manufacturer.

Blower inlet and outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start-up.

The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventative to protect the machine during shipment. Remove this film upon initial startup, using any commercial safety solvent. Position the blower so that the inlet and discharge connections are in the vertical position (vertical airflow). On vertically mounted units, it will be necessary to lay the unit on its side supporting the ends of the unit so as not to restrict the port on the bottom side. Place a shallow pan on the under side of the unit. With the blower disconnected from power, spray the solvent in the top port, rotating the impellers by spinning the shaft manually. Continue this procedure until the unit is visibly clean.



Rotating components will cause severe injury in case of personal contact. Keep hands and loose clothing away from blower inlet and discharge ports.

SECTION 2 INSTALLATION

LOCATION

Install the blower in a well lit, clean dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installation we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts to remove strain from the blower housing.

Where jack screws or wedges are used during grouting, they must be backed off and wedges removed before final tightening of anchor bolts. Refer to grouting instructions.

Where a concrete foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members, restricting movement and vibration.

MOUNTING CONFIGURATIONS

The blower flex-mount design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are center timed allowing rotation in either direction (refer to Figure 2-1).

REPOSITIONING THE MOUNTING FEET.

- 1. Position the mounting feet to the desired location and snug the capscrew.
- 2. Place the blower on its feet on a flat surface.
- 3. Loosen mounting feet capscrews and level unit up. The bench or blower base flatness should be within .002 of an inch.

NOTICE

If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

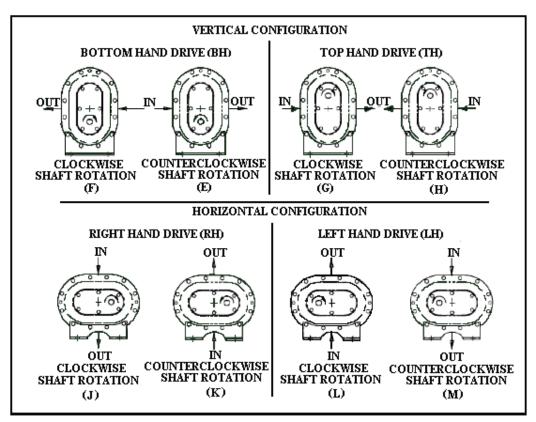


FIGURE 2-1 - BLOWER MOUNTING CONFIGURATIONS

4. Secure the mounting feet capscrews to the torque value in Figure 7-9, page 38.

NOTICE

When changing mounting configuration, it may be necessary to reposition breather/oil fill (B), oil level gauge (H) and drain plug (A). Refer to Figure 3-1, page 17, for correct location.

DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded. Refer to FIGURE 2-2, page 15, for overhung load calculations and limitations.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/32 inch. Belt tension should be carefully adjusted to the belt manufacturer's recommendation using a belt tension gauge. Check tension frequently during the first day of operation.



Over tightening belts leads to heavy bearing loads and premature failure.

On the direct connected units, alignment and lubrication of couplings to specifications of the coupling manufacturer is very important. When mounted drives are supplied from the factory proper alignment has been established before shipment. However, during shipping, handling and installation, it is likely that the alignment has been disturbed and final adjustment must be made before startup.



Exceeding overhung load limitations leads to unwarrantable premature bearing failure and shaft breakage.

The location of the sheave on the blower shaft greatly affects the stress in the shaft. The optimum blower sheave positioning is as close as possible to the blower drive cover, not to exceed dimension "C" in Drive Shaft Illustration, FIGURE 2-2, page 15

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, FIGURE 2-2 page 15. If the calculated shaft moment exceed the maximum allowable moment:

- Increase Sheave Diameters to Reduce Belt Pull
- Use Jackshaft Drive
- Use Direct Coupled or Gearbox Drive

To calculate shaft moment for a given V-Belt Drive Arrangement:

- 1. Use the formula for Calculation of Belt Pull, FIGURE 2-2, page 15, to calculate belt pull. Refer to Arc of Contact Factor Chart, Figure 2-2, page 15.
- 2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, FIGURE 2-2, page 15 to arrive at the calculated shaft moment.

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential. Excessive weight of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, the weight of the rigid connection must be separately supported.

All system piping must be cleaned internally before connecting to the blower.

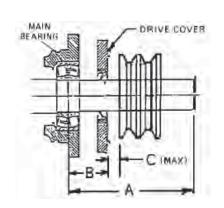


Sutorbilt blowers are shipped dry from the factory. Do not attempt to operate the blower before following proper lubrication instructions. Permanent damage to the gears, bearings and seals will occur.

	0	Maximum		
Gear		Dimens	ions	Allowable
Diameter		(Inche	es)	Moment
(Inches)	Α	В	С	(LB-IN)
,			(Max)	, ,
3	2.88	.85	.38	385
4	3.49	1.10	.38	490
5	3.90	1.40	.38	1245

MAXIMUM ALLOWABLE MOMENT

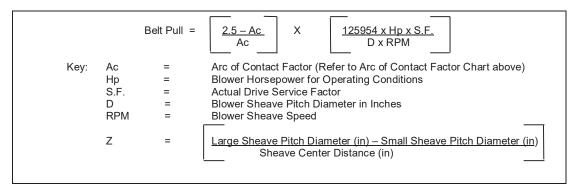
	DU	Maximum		
Gear		Dimens	ions	Allowable
Diameter		(Inche	es)	Moment
(Inches)	Α	В	С	(LB-IN)
			(Max)	, ,
3	3.07	1.18	.25	385
4	3.62	1.27	.25	650
5	3.85	1.39	.25	1370



MAXIMUM ALLOWABLE MOMENT

Z	Ac										
0.000	1.000	0.250	0.966	0.500	0.926	0.750	0.879	1.000	0.823	1.250	0.751
0.025	0.997	0.275	0.962	0.525	0.922	0.775	0.874	1.025	0.816	1.275	0.742
0.050	0.994	0.300	0.958	0.550	0.917	0.800	0.869	1.050	0.810	1.300	0.734
0.075	0.990	0.325	0.954	0.575	0.913	0.825	0.864	1.075	0.803	1.325	0.725
0.100	0.987	0.350	0.951	0.600	0.908	0.850	0.858	1.100	0.796	1.350	0.716
0.125	0.983	0.375	0.947	0.625	0.904	0.875	0.852	1.125	0.789	1.375	0.706
0.150	0.980	0.400	0.943	0.650	0.899	0.900	0.847	1.150	0.782	1.400	0.697
0.175	0.977	0.425	0.939	0.675	0.894	0.925	0.841	1.175	0.774	1.425	0.687
0.200	0.973	0.450	0.935	0.700	0.889	0.950	0.835	1.200	0.767		
0.225	0.969	0.475	0.930	0.725	0.884	0.975	0.829	1.225	0.759		

ARC OF CONTACT FACTORS



CALCULATION OF BELT PULL

Shaft Moment (LB-IN) = Belt Pull
$$\times \left[B + C + \left(\frac{\text{Sheave Width}}{2}\right)\right]$$

CALCULATION OF SHAFT MOMENT

FIGURE 2-2 - BELT DRIVE OVERHUNG LOAD CALCULATIONS

AIR FILTERS AND FILTER SILENCERS

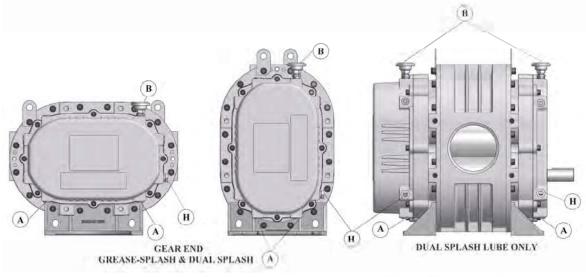


Servicing the air filters is one of the most important maintenance operations to be performed to insure long blower life.

Servicing frequency of filter elements is not time predictable. A differential pressure indicator, with a continuous gauge reading, should be installed across the inlet filter. It will tell how much of the service life of the filter element has been used. It will also eliminate both premature filter servicing and premature blower failure due to a plugged filter when the filter pressure drop is used to establish maintenance points. In all cases refer to the filter manufacturer's service instructions. Due to the many types of filters, it is not practical to give specific instructions covering all models.

NOTICE

No matter what type of filter is used, always make sure all seats, gaskets, clamps and hose connections on the filter and inlet line are absolutely air tight. Each time the filter is serviced, inspect interior of the blower for dirt.



- A. OIL DRAIN PLUG
- B. BREATHER/OIL FILL
- C. GREASE FITTING
- E. GREASE VENTS
- H. OIL LEVEL GAUGE

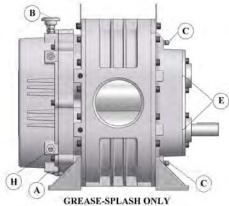


FIGURE 3-1 - LUBRICATION

DRIVE END LUBRICATION (For Grease – Splash Lube Blowers)

Drive end bearings are grease lubricated at the factory with Lithium Complex based grease. **For relubrication, use Gardner Denver AEON PD Grease, Part Number 28H283.** AEON PD Grease is a high temperature, high performance grease that is formulated with antiwear additives to provide superior service under the severe operating conditions of positive displacement blowers. It contains rust inhibitors which provide excellent protection against rust and corrosion.

If you choose not to use AEON PD Grease, select compatible base grease. The grease should be NLGI Grade 2 EP, contain rust inhibitors, and be suitable for blower discharge temperatures up to 350° F (177° C). Completely clean or purge the factory--filled grease from the blower. **Do not mix different types of grease as they may not be compatible. Substitutions may cause early bearing failure.**

Re-grease bearings every 500 hours of operation. Lubricate each bearing through the grease fittings located at C in FIGURE 3-1 (2 places). When re-greasing, the old grease will be forced out of the vents (E in FIGURE 3-1). To prevent damage to seals, these vents must be open at all times.



Do not over--grease bearings as this could cause premature bearing failure.

DRIVE END LUBRICATION (For Dual Splash Lube Blowers)

At the drive end, the bearings are lubricated by the slinger, which must be on the lowest rotor when in a vertical configuration.

Approximate oil sump capacities are listed in Figure 3-2.

NOTICE Machines are shipped without oil in the sump. Do not operate before adding lubricant.

Lubrication Instructions

Filling procedure

Refer to Figure 3-1, page 17. Remove the breather (B) from the drive cover. Add oil to the drive sump until oil reaches the center of the oil level gauge (H). Secure breather (B) in the drive cover.

Add fresh oil as required to maintain proper level. The oil level should be at the middle of the sight glass when the machine is not operating. Refer to Figure 3-2, for approximate oil capacities.

Legend "R" Series, Grease-Splash Lube Blower Oil Capacities

	Approximate Sump capacity in pints or ounces							
Vertical Configuration			Vertical Configuration			zontal Configu	ıration	
Series	Gear Diameter (in)	Gear End	Drive End	Total	Gear End	Drive End	Total	
3	3.5	0.6 PT (9 oz.)	grease	0.6 PT (9 oz.)	1.1 PT (18 oz.)	grease	1.1 PT (18 oz.)	
4	4	0.9 PT (14 oz.)	grease	0.9 PT (14 oz.)	1.5 PT (24 oz.)	grease	1.5 PT (24 oz.)	
5	5	1.1 PT (18 oz.)	grease	1.1 PT (18 oz.)	2.5 PT (40 oz.)	grease	2.5 PT (40 oz.)	

Note: Quantities are for purchase estimates only.

Legend "R" Series, Dual Splash Lube Blower Oil Capacities

	Approximate Sump capacity in pints or ounces								
	Vertical Configuration Horizontal Co			Horizontal Configuration					
	Gear Diameter	Gear	Drive		Gear	Drive			
Series	(in)	End	End	Total	End	End	Total		
3	3.5	0.6 PT (9 oz.)	0.3 PT (5 oz.)	0.9 PT (14 oz.)	1.1 PT (18 oz.)	0.6 PT (9 oz.)	1.7 PT (27 oz.)		
4	4	0.9 PT (14 oz.)	0.4 PT (6 oz.)	1.3 PT (20 oz.)	1.5 PT (24 oz.)	0.7 PT (11 oz.)	2.2 PT (35 oz.)		
5	5	1.1 PT (18 oz.)	0.6 PT (9 oz.)	1.7 PT (27 oz.)	2.5 PT (40 oz.)	1.2 PT (19.1 oz)	3.7 PT (59.1 oz.)		

Note: Quantities are for purchase estimates only.

FIGURE 3-2 - APPROXIMATE OIL CAPACITIES

GEAR END LUBRICATION (For Grease – Splash Lube and Dual Splash Lube Blowers)

At the gear end, the timing gear teeth are lubricated by being partially submerged in oil. The gear teeth serve as oil slingers for gear end bearings.

Approximate oil sump capacities are listed in Figure 3-2.



Do not overfill as this will tend to cause excessive heating of the gears and may damage the unit.

NOTICE

Machines are shipped without oil in the sump. Do not operate before adding lubricant.

LUBRICATION INSTRUCTIONS

Filling procedure Refer to FIGURE 3-1, page 17. Remove the breather (B) from the gear cover. Add oil to the gear case until oil reaches the center of the oil level gauge (H). Secure breather (B) in the gear cover.

Add fresh oil as required to maintain proper level. The oil level should be at the middle of the sight glass when the machine is not operating. Refer to Figure 3-2, page 18, for approximate oil capacities.

RECOMMENDED LUBRICANT

AEON PD Synthetic Blower Lubricant is recommended. Refer to FIGURE 3-3, for AEON PD, AEON PD-FG (Food Grade) and AEON PD-XD (Extreme Duty) part numbers. Order AEON PD from your Gardner Denver Distributor or call Gardner Denver directly.

Convenient Package Sizes	AEON PD Part No.	AEON PD-FG Part No.	AEON PD-XD Part No.
1 quart	28G23	28H97	28G46
Case 12 quarts	28G24	28H98	28G47
1 gallon	28G40	28H333	28G42
Case 6 gallons	28G41	28H334	28G43
5 gallon pail	28G25	28H99	28G44
55 gallon drum	28G28	28H100	28G45

FIGURE 3-3 – AEON PD SYNTHETIC LUBRICANT

AEON PD is formulated especially for positive displacement blower service to provide maximum blower protection at any temperature. One fill of AEON PD will last a minimum of 4 times longer than a premium mineral oil. Refer to FIGURE 3-4.

		Ambient Temperatures			
		Less than 10° F	10°F to 32°F	32°F to 90°F	Greater than 90°F
	Less than 32°F	AEON PD AEON PD-FG	AEON PD AEON PD-FG		
	32° F to 100° F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	
Blower Discharge Temperature	100° F to 225°F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG
Tomporataro	225° F to 300° F	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD AEON PD-FG	AEON PD XD
	Greater than 300°F			AEON PD XD	AEON PD XD

FIGURE 3-4 - SYNTHETIC LUBRICANT CHART

AEON PD Synthetic Lubricant should be drained after 6000 hours of operation. Re-fill with fresh AEON PD oil. If mineral oil is used, perform the above oil change maintenance every 1500 hours. Recommended service intervals are for normal blower operating conditions. Severe operating conditions may warrant more frequent oil changes. Laboratory analysis of lubricant should be used to help determine the optimum oil change interval.

For best performance and equipment protection, use AEON PD Synthetic Lubricant, which has been specifically formulated for positive displacement blowers. If you choose not to use AEON PD Synthetic Blower Lubricant, select an oil with rust and oxidation inhibitors, anti-foam additives, and the viscosities listed in FIGURE 3-5. Do not use an oil that contains EP additives.

NOTICE Flush the oil whenever a change is made from one type of oil to another.

Drain the current lubricant as thoroughly as possible. Refill with the new lubricant. Fill to normal level of the blower, which is at the middle of the sight glass when the machine is not operating. Run the blower for one hour. Shut off the blower and drain the lubricant completely. Refill the blower again with the new lubricant.

Blower Discharge	Ambient Temperature						
Temperature	Less than 10° F*	10° F to 32° F**	32° F to 90° F	Greater than 90° F			
Less than 32° F (0° C)	ISO 100	ISO 100					
32° F to 100° F (0° C to 38° C)	ISO 100	ISO 100	ISO 150				
100° F to 225° F (38° C to 105° C)	ISO 100	ISO 100	ISO 150	ISO 220			
225° F to 300° F (105° C to 149° C)	ISO 150	ISO 150	ISO 220	ISO 220			
Greater than 300° F (149° C)			***	***			

- * For ambient temperatures less than 10° F, but not less than –20° F, the use of oil sump heaters, heated enclosures or synthetic lubricant is required.
- ** For ambient temperatures 10° F to 32° F, the use of oil sump heaters, heated enclosures or synthetic lubricant is recommended.
- *** The lubricant viscosity must be 70 SUS minimum at the lubricant operating temperature.

The pour point of the lubricant should be at least 5° to 10° F below the minimum expected ambient temperature.

For continuous operation, where the lubricant temperature exceeds 200° F, synthetic lubricant is recommended.

FIGURE 3-5 - LUBRICATION RECOMMENDATION

SECTION 4 OPERATION

Future operating problems can be avoided if proper precautions are observed when the equipment is first put into service.

Before starting under power, the blower should be turned over by hand to make certain there is no binding or internal contact.

Each size blower has limits on pressure differential, running speed and discharge temperature which must not be exceeded. These limits are shown in "Maximum Operating Limitations", FIGURE 4-1, below.



Operating beyond the specified operating limitations will result in damage to the unit.

It is important that the pressures and temperatures are measured directly at the ports of the blower to avoid error that may be caused by intervening pipe runs, fittings, etc.

Relief valves must be used to protect against excessive pressure or vacuum conditions. These valves should be tested at initial startup to be sure they are adjusted to relieve at or below the maximum pressure differential rating of the blower.

NOTICE

Relief valves should be placed as close as possible to the blower inlet or discharge.

In some instances, pressure may be relieved at a lower point than the blower maximum in order to protect the motor or the equipment served by the blower.

Discharge temperature switches are recommended to protect against excessive inlet restriction or inlet temperatures. Check valves in the discharge line on pressure blowers and in the inlet line on vacuum blowers are recommended to protect the blower from motoring backwards when shut down under load.

LIMITATIONS

For information regarding limitations, refer to FIGURE 4-1, below.

MAXIMUM / MINIMUM OPERATING LIMITATIONS							
SIZE	MAX. RPM	MIN. RPM VERT.	MIN RPM HORIZ.	MAX. PRESSURE PSI	MAX VAC IN HG	MAX. TEMPERATURE RISE ° F	MAX. DISCHARGE TEMPERATURE ° F
01.5	0000	4500	1001	_	4.4	400	000
3LR	3600	1528	1091	1	14	160	260
3MR	3600	1528	1091	12	15	180	280
3HR	3600	1528	1091	15	16	220	320
4LR	3600	1337	955	7	14	160	260
4MR	3600	1337	955	10	16	185	285
4HR	3600	1337	955	15	16	210	310
5LR	2850	1070	764	7	14	160	260
5MR	2850	1070	764	13	16	180	280
5HR	2850	1070	764	15	16	200	300

DO NOT EXCEED THESE LIMITS

NOTICE

Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations. The minimum RPM for the blowers is based on lubrication only. The blowers may only be operated down to the minimum RPM, when the temperature rise and discharge temperature are below the maximum limitations as shown.

FIGURE 4-1 - MAXIMUM / MINIMUM OPERATING LIMITATIONS

BLOWER STARTUP CHECKLIST

This startup procedure should be followed during the initial installation and after any shutdown periods or after the blower has been worked on or moved to new location. It is suggested that the steps be followed in sequence and checked off $(\sqrt{})$ in the boxes provided.

1.	Check the unit and all piping for foreign material and clean if required.
2.	Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause housing distortion and internal rubbing. Misaligned V-drives can cause the rotors to rub against the headplates and cause a reduction in the volumetric efficiency of the unit. Misaligned couplings can ruin bearings.
3.	If the blower is V-belt driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing/shaft loads which lead to premature failure.
4.	Be sure adequate drive guards are in place to protect the operator from severe personal injury and incidental contact.
5.	Check the unit for proper lubrication. Proper oil level cannot be over-emphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Insure that grease lubricated bearings are properly lubricated.
6.	With motor electrical power locked out and disconnected, turn the drive shaft by hand to be certain the impellers do not bind.
7.	"Jog" the unit with the motor a few times to check that rotation is in the proper direction, and to be certain it turns freely and smoothly.
8.	The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. This film should be removed upon initial startup.
9.	Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.
10.	Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.
11.	If malfunctions occur, do not continue to operate. Problems such as knocking rotors can cause serious damage if the unit is operated without correction.

SAFETY PRECAUTIONS

- 1. Do not operate blower with open inlet or outlet port.
- 2. Do not exceed specified vacuum or pressure limitations.
- 3. Do not operate above or below recommended blower speed range.
- 4. Blower is not to be used where non-sparking equipment is specified.
- 5. Do not operate without belt guard or coupling shield.



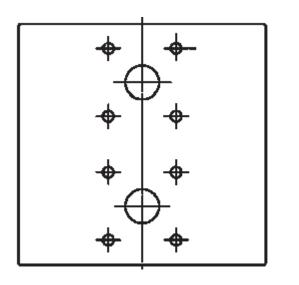
6. The blower and blower discharge piping may be extremely hot and cause skin burns on contact.

TROUBLE SHOOTING

No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The Trouble Shooting Chart below is provided to assist the mechanic in those respects.

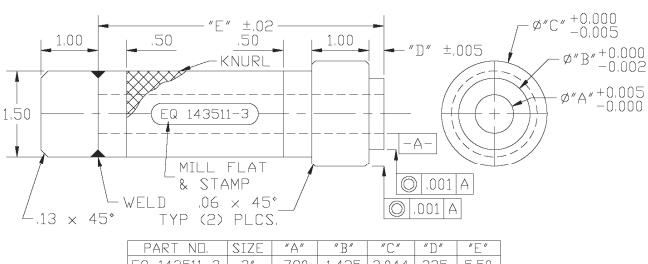
PROBLEM	POSSIBLE CAUSES	SOLUTION
	Unit out of time.	Re-time impellers
	Distortion due to improper	Check mounting alignment and
	mounting or pipe strains.	relieve pipe strains.
Knocking	Excessive pressure differential.	Reduce to manufacturer's
Knocking		recommended pressure. Examine relief
		valve, re-set if necessary.
	4. Worn gears.	Replace timing gears.
	5. Worn bearings.	5. Replace bearings
	 Too much oil in gear case. 	Reduce oil level.
	Too low operating speed.	Increase blower speed.
	3. Dirty air Filter.	Clean or replace air filter
Excessive blower temperature.	Clogged filter or muffler.	Remove cause of obstruction.
Exocosive blower temperature.	5. Excessive pressure differential.	Reduce pressure differential
		across the blower.
	Worn impeller clearances.	Replace impeller.
	7. Internal contact.	7. Correct clearances.
	Insufficient assembled	 Correct clearances.
	clearances.	
Impeller end or tip drag.	2. Case or frame distortion.	Check mounting and pipe strain.
	3. Excessive operating pressure.	3. Remove cause.
	Excessive operating	Remove cause
	temperature.	
	Slipping belts.	Tighten belts.
Edok of Volumo.	2. Worn clearances.	Re-establish proper clearances.
	Dirty air filter	Clean or replace air filter.
Excessive bearing or gear wear.	Improper lubrication.	Correct lubrication level. Replace dirty
		oil.
	Headplate, gear case or drive	1. Clean vents.
Loss of oil.	cover vents plugged.	
	2. Worn Seal.	2. Replace seals.

ORDER SPECIAL TOOLS BY PART NUMBER. SEE PAGE 2 FOR ORDERING INSTRUCTIONS.



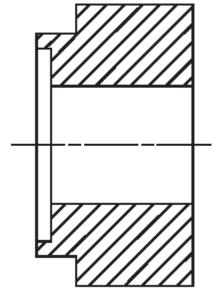
Unit Size	Part Number	
3"	201GAA340	
4"	202GAA340	
5"	203GAA340	

FIGURE 5-1 - PULLER PLATE



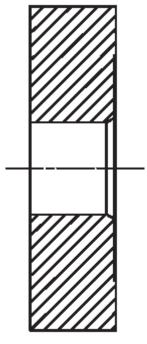
EQ 143511-3 3" .790 1,435 2,044 .335 5.50 EQ 143511-4 4" 1.000 1,624 2,436 ,395 6.25 EQ 143511-5 5" 2.247 2.829 .695 7.00 1.184

FIGURE 5-2 - SEAL DRIVE



Unit Size	Part Number
3"	205GAA074
4"	206GAA074
5"	207GAA074

FIGURE 5-3 - MECHANICAL SEAL INSTALLATION TOOL



Unit Size	Part Number
3"	201GAA074
4"	202GAA074
5"	203GAA074

FIGURE 5-4 - BEARING PRESS TOOL - MECHANICAL SEAL UNITS

SECTION 6 DISASSEMBLY INSTRUCTIONS

NOTICE

Numbers in parentheses () refer to key numbers in assembly drawings on pages 39 and 43.

- 1. Drain oil from gear case by removing drain plug (2).
- 2. Remove the socket head bolts (5) from the gear cover (3).
- 3. Remove the gear cover from the gear headplate.

NOTICE

The cover and gear headplate gasket tends to bond tightly to both surfaces. After socket head bolt removal, it is sometimes necessary to take a ball peen hammer and a blunt chisel and drive off the cover.

IMPORTANT:

MARK ALL PARTS WITH A CENTER PUNCH SO THEY CAN BE REASSEMBLED IN THE SAME POSITION (IMPELLERS, HEADPLATES, AND GEARS).

- 4. If the timing gears appear undamaged, the gear backlash must be checked to see if the gears can be salvaged.
 - A. Mount a magnetic base dial indicator on the gear headplate (see FIGURE 6-1).
 - B. Lock one impeller stationary by wedging a feeler gauge between the impeller and the headplate.
 - C. The tip of the indicator should be placed at the center of the contact surface on a tooth of the gear on the free shaft.
 - D. Rock the impeller back and forth by hand and read the total rotational movement to the nearest .0005 inches. Do this at four gear mesh positions 90 degrees apart.
 - E. Permissible gear backlash is shown below.

GEAR DIA.	GEAR BACKLASH
3"	.00150025
4"	.00150025
5"	.002003



FIGURE 6-1



FIGURE 6-2



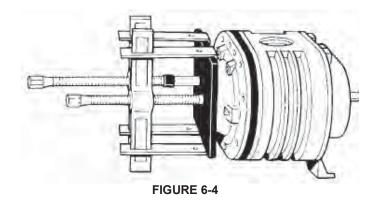


FIGURE 6-3

NOTICE

If backlash is above the specified limit, the gears are not necessarily unusable. Excessive play could be caused by worn bearings.

- 5. If timing gears appear to be reusable, match marktiming gear toothmesh by making small punch marks on the ends of meshing gear teeth with a pin punch and hammer (see FIGURE 6-2, page 27). The impeller tip to valley (throat) and the case to headplates should also be matchmarked to facilitate blower reassembly.
- 6. Remove all cap screws from both gear locking assemblies (see FIGURE 6-3). Thread 3 of these cap screws into the threaded holes in the outer ring of each locking assembly. Tighten the screws evenly to remove the locking assembly from each gear. Remove the gears (9) from both rotor shafts.

NOTICE

Blowers with mechanical seals have two wavy washers (28) located between the bearings and the cover on the drive end.

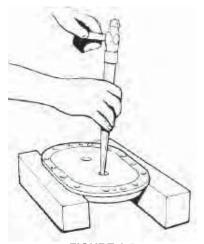


FIGURE 6-5

7. Remove the socket head cap screws (30) from the drive end bearing cover (29) and remove the cover. Support the external surface of the drive end cover near the oil seal with blocks of wood. Drive the oil seal from the cover using a hammer and punch. Discard the seal as it will not be reused. Replace oil seals each time the drive end cover is removed.

For Dual Splash Version

Remove the socket cap screws (84) from each slinger and remove slingers.

For Dual Splash Version with Mechanical Seal

Remove the socked cap screws (84) from each slinger and remover slingers. Remove flat head cap screws (86) from wavy spring retainer plates and remove retainer plate and wavy spring.

- 8. Remove mounting foot (17) from the drive headplate (24) by removing the capscrews (16).
- 9. Remove the capscrews (21) which secure the drive headplate (24) to the impeller case (22).
- 10. Using the puller plate shown on page 25, bolt to the drive headplate using the tapped holes on used to secure the drive cover.
- 11. Install a gear puller to each shaft and attach puller arms to the plate. Turn each puller only half a revolution at a time keeping the advance of the shafts as uniform as possible (see Figure 6-4). After the headplate has been removed, detach the puller plate.
- 12. Remove the two drive end bearings (35 and 80 for dual splash lube) or (14 and 35 for grease) from the drive headplate (24) using a ball peen hammer and punch (see Figure 6-5, page 28).



Exercise care not to damage the headplate bearing bores when removing bearings.

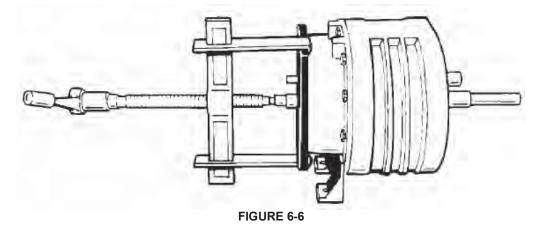
13. The oil seals can now be driven out of the drive headplate with hammer and punch (see Figure 6-5, page 28). Discard the seals as they will not be reused. Replace oil seals each time the headplate is removed.

For Mechanical Seal Version

Remove mechanical seal from the drive headplate.

NOTICE

Seals and bearings should be replaced during overhaul as a matter of service policy.



14. Remove the four bearing retaining screws (10), and washers (12) from the gear headplate.

For Mechanical Seal Version

Remove bearing retainer plate by removing 8 screws.

- 15. Attach puller plate to the gear headplate using the tapped holes on the bearing housing.
- 16. Install a gear puller to one of the shafts and attach puller arms to the plate (see Figure 6-6).
- 17. Remove mounting foot (17) from the gear headplate by removing 4 capscrews (16).
- 18. Push the impeller shaft through the gear headplate and remove the impeller assembly(23) (see Figure 6-6). Remove the other impeller assembly following the same procedure.
- 19. Remove the cap screws (21) securing the gear headplate to the impeller case. Located near each dowel pin on the headplate is a threaded hole. Insert a 5/16-18 UNC capscrew into each of the threaded holes. Tighten the screws evenly until the headplate separates from the impeller case.
- 20. Remove the two gear and bearings (14) from the gear headplate (18) as done in step 12.
- 21. Remove the oil seals (15) from gear headplate (19) as done in step 13.

SECTION 7 ASSEMBLY INSTRUCTIONS

NOTICE

Numbers in parentheses () refer to key numbers in assembly drawings on pages 39 and 43.

- 1. Make sure all metallic parts are clean and free of any nicks or burrs.
- 2. Lubricate the outside diameter of the lip seal (15) with a light oil or grease. Install seals in both the drive headplate (24) and gear headplate (18). Use the seal driver (Figure 5-2). The seal lip should always face towards the bearing or lubricant. New seals should be installed each time the headplate is removed.

NOTICE

Make sure seals are fully seated. Use extreme care when installing.

MECHANICAL SEALS ONLY

- A. Lightly coat the headplate bores with assembly lubricant.
- B. Refer to Figure 7-1. Install mechanical seal (A) into the headplate bore (C) using a press and the correct driver shown on page 26. Drive the seal securely on to its seat.

⚠ CAUTION

Use extreme care when installing seals in the headplate bores. Do not attempt to install the mechanical seals without the use of a press. Blows from a hammer or mallet can damage the fragile seal surface. Too much force can crush the seal casing. Make certain the seal is properly seated and undamaged before proceeding.

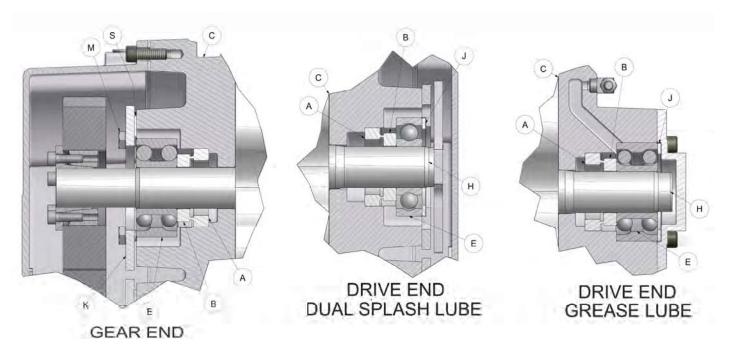


FIGURE 7-1





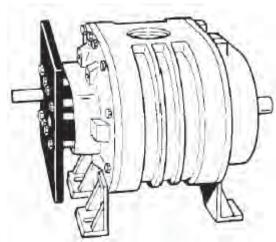


FIGURE 7-3

3. Assemble gear headplate (18) and mounting foot (17) to the impeller case with cap screws (21) and where the mounting foot is secured to the headplate use capscrews (16). The two positioning dowel pins (19) will ensure proper alignment of the headplate and impeller case. Also secure lifting lugs using capscrews (21) (see exploded assembly drawing on page 39. Refer to Figure 7-9, page 38, for torque specifications.

⚠ CAUTION

Seals are delicate; use extreme care when installing impeller shafts in the headplate bores. A piece of light shim stock wrapped around the shaft keyway will prevent cutting the seal lip.

- 4. Apply a light oil or grease on the shaft seal areas and the bearing areas. Insert impellers into the gear headplate using the same headplate bores as used in the original assembly.
- 5. Position blower so that impellers are vertical, with the drive end on top. It will be necessary to use blocks in order for the unit to set level. Measure the total end clearance using a depth micrometer (see Figure 7-2).

NOTICE

If more than .007" shim is required, put .007" on the drive end and the remaining on the gear end.

If total clearance is not within the limits specified in Figure 7-4, page 33, it may be necessary to shim the case to obtain the proper total end clearance. The shim should be placed between the drive headplate and impeller case.

6. Assemble drive headplate (24) to impeller case as in step 3 with the gear headplate. If shims were required, place shims between drive headplate and impeller case.

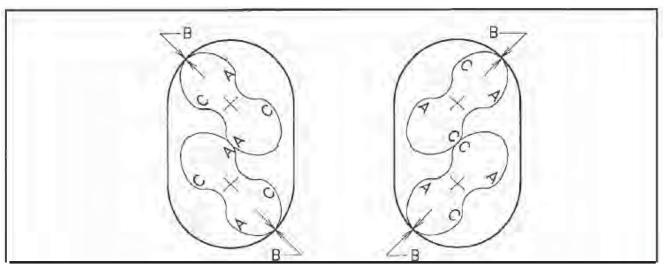
MECHANICAL SEALS ONLY

- A. Refer to Figure 7-1, page 31. Lightly coat the impeller shaft (H) and the inside diameter of the mating ring (B) with assembly lubricant.
- B. Install the mating ring (B) on the shaft only far enough to get the bearing (E) started on the shaft.



Do not drive the mating ring down to the mechanical seal, as this can damage the seal.

- C. Lightly lubricate the bearing inner race (E) with a light oil or grease.
- D. Using a press, install the bearing on the shaft with the bearing driver shown on page 24.



INTERNAL CLEARANCES FOR STANDARD UNITS ONLY

	3H	3M	3L	4H	4M	4L	5H	5M	5L	
TOTAL END CLEARANCE		0.007-0.011		0.007-0.011			0.007-0.011			
IMPELLER TO GEAR HEADPLATE		0.003-0.005	;		0.003-0.005			0.003-0.005		
IMPELLER TIMING (A-A) (C-C)	0.005- 0.007	.006008		0.006- 0.008	.007010		<u>.007-</u> .010	.0080	10	
TIP TO CASE CLEARANCE (B-B)		0.002 min.		0.002 min.			0.002 mir	١.		

FIGURE 7-4

The bearing driver will position the mating ring (B) to the correct depth with respect to the mechanical seal (A).

- 7. Apply a light oil to the drive headplate bearing bore, bearing inside diameter, and shaft seat. Install the drive end bearings (14and 35 for grease) or (80 and 35 for dual splash lube) as far as possible without force.
- 8. Attach the puller plate shown on page 25, to the drive headplate using the tapped holes used on the drive headplate (see FIGURE 7-3, page 32). Tighten the bolts so that the advance of the bearings stay as uniform as possible. Bearings should be pressed until flush with the drive headplate.
- 9. Lubricate the gear end bearing fits with a light oil as described previously. Install gear end bearings (14) as far as possible without force. Use the plate, used to install the drive end bearings, to press the bearings on the shafts as described in Step 8. Press bearings into the gear headplate until completely seated in the bearing bore.

NOTICE

Bearings will not be flush with gear headplate bores when completely seated.

- 10. Impellers should now be checked for free axial movement by hitting the ends of the impeller shafts with the palm of your hand.
- 11. Push the impellers against the gear headplate and recheck the total end clearance between the drive headplate and the impellers (see FIGURE 7-4).
 - A. If total end clearance is insufficient, loosen impeller case to headplate bolts on either headplate, and move the headplate away from the case far enough to insert a paper shim in the amount equal to the insufficient clearance. Retighten case bolts and again check the total end clearance. Refer to FIGURE 7-4 for correct clearance.
 - B. Excessive end clearances normally will require new impeller assemblies, but in some circumstances the impeller case can be removed and reduced in width by machining off the amount of excess clearance.
 - C. Apply Loctite 246 on the 4 bearing retaining screws. Install 4 bearing screws and washers into the gear end headplate. Tighten screws evenly to the torque value given in FIGURE 7-9.

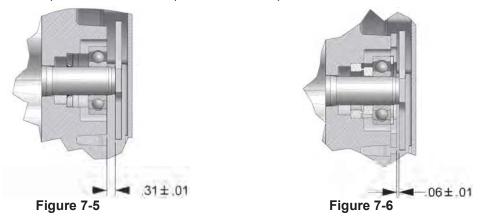
For Mechanical Seal Version

Install 8 bearing retaining screws and washers into the gear bearing retainer plates. Tighten screws evenly.

12.

A. Dual Splash Version

Install slingers on both shafts. Hold .31" +/_.01" gap between face of the bearing and back of the slingers. Rotate slingers approximately 90 degree apart, apply Loctite 246 on the socket cup screw and tight. Recommended torque is 3-3.5 FT-LBS. (See FIGURE 7-5).



B. For Dual Splash Version with Mechanical Seal

Install slingers on both shafts. Hold .06"+_.01" gap between wavy spring retainer plates and back of the slingers. Rotate slingers approximately 90 degree apart, apply Loctite 246 on the socket cup screw and tight. Recommended torque is 3-3.5 FT-LBS. (See FIGURE 7-6).

13. SETTING IMPELLER END CLEARANCES

Refer to FIGURE 7-7, page 34. The outer races of the gear end bearings are clamped against the headplate (F) by the bearing retaining screws or by bearing retainer plate (mechanical seal version) (B).

This is referred to as the "fixed end". The interference fit between the shaft and the bearing inner race (H) keeps the shaft from moving axially. Adjustment is by movement of the shaft through the gear end bearing inner race (H).

A. Check the total end clearance by adding the clearance between the impellers and the drive headplate to the clearance between the impellers and the gear headplate.

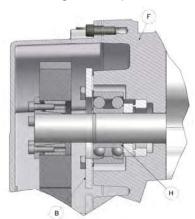


Figure 7-7

NOTICE

Check the clearance over the entire width of the impeller and consider the tightest spot.

- B. Divide the end clearance by 3 and distribute approximately 1/3 on the gear end and the remaining 2/3 on the drive end.
- C. To move the impeller assembly toward the drive end, lightly tap the shaft at the gear end with a soft face mallet.
- D. To move the impeller assembly toward the gear end, lightly tap the shaft at the drive end with a soft face mallet.
- E. To set the fixed end, insert the feeler gauge in the amount specified in FIGURE 7-4, page 33, between the headplate and the impeller at the gear end.
- F. Tap lightly until the feeler gauge is snug. Adjust both impellers using the same procedure. Rotate the impellers checking for clearance through a complete revolution.

SETTING IMPELLER END CLEARANCE WITH MECHANICAL SEALS

Refer to FIGURE 7-1, page 31. The gear end bearings are held in position by the force created by the wavy spring (J) on the drive end and the bearing retainer (K) on the gear end. This is referred to as the fixed end. The interference fit between the shaft (H) and the bearing inner race (E) keeps the shaft from moving axially.

End clearance adjustment is by movement of the bearing retainer (K). Tightening the bearing retainer screws (M) moves the bearing to load the wavy spring (J), and the impeller is forced toward the drive end. Relaxing the screws allows the wavy spring to return the impeller toward the gear end.

- A. Assemble drive cover to drive headplate. Refer to Step 15 with the exception of the use of wavy springs (J) installed between the drive end bearings and the wavy spring retainer plates.
- B. Back out retainer screws (M) until both impellers are tight against the gear headplate.
- C. With feeler gauge, measure the clearance between each impeller and the drive headplate. This value is the total end clearance.
- D. Measure the clearance between the gear headplate and bearing retainer (K) at point (S).
- E. Subtract 1/3 of the total end clearance from the clearance measured at point (S). This value is the amount of shim (13) that should be placed between the retainer and the headplate at point (S).
- F. Tighten the bearing retainer screws (M) to the torque value given in FIGURE 7-9, page 38. With the retainer screws secure, approximately 1/3 of the total end clearance should be on the gear end and the remaining 2/3 on the drive end.

1. INSTALLING THE TIMING GEARS

If reusing the timing gears, the gears should be returned to their original positions.

- A. Obtain 2 gear locking assemblies. Clean the inside and outside diameters of both locking assemblies. Clean the inside diameter of 2 gears. Clean the outside diameter of the both rotor shafts. Lightly oil the surfaces that have been cleaned. Note: DO NOT USE MOLYBDENUM DISULFIDE, MOLYKOTOE, OR ANY OTHER SIMILAR LUBRICANTS.
- B. Slide a locking assembly into a gear. Install the gear and locking ring assembly onto the idler rotor shaft. Push the locking assembly firmly until flush with the end of the idler rotor shaft and hand tighten the 7 cap screws. Align and adjust the connections.
- C. Use a torque wrench to tighten the screws to 75 in. lbs. in a diametrically opposite sequence. Ensure that none of the screws will turn when 75 in. lbs. is applied to them a second time.
- D. Tighten the screws further to 150 in. lbs. in a diametrically opposite sequence. Ensure that none of the screws will turn when 150 in. lbs. is applied to them a second time.
- E. Slide the second locking assembly into a gear. Install the gear and locking ring assembly onto the drive rotor shaft. Note the circular mark on each gear indicates the position of the largest runout. These marks must be 180 degrees apart when the gears are installed.
- F. Push the locking assembly firmly until flush with the end of drive rotor shaft and hand tighten all cap screws but leave them loose enough that the gear can be rotated on the shaft.
- G. The first step in setting the interlobe clearance is to measure the total clearance between two meshing lobes. This is accomplished by determining the maximum feeler gauge thickness that will fit between the rotor lobes near the pitch diameter. The clearance should be measured along the entire length of the meshing lobes. This measurement should be taken for each of the 2 interlobe meshes. The location of the smallest total interlobe clearance should be marked on the rotor lobes. Refer to diagram in FIGURE 7-4, page 33. Use feeler gauges to check clearances between impeller lobes at positions A—A and C—C. Add the clearances, and divide the total clearance evenly between A—A and C—C.
- H. Rotate the rotors until the two lobes that have the smallest total interlobe clearance (as determined in step G) are visible through the discharge port. Lock the idler rotor from turning by wedging a shop rag between the tip of a lobe and the air cylinder. Insert feeler gauges with a thickness equal to the half clearance (determined in step G) between the drive rotor and the idler rotor lobe. Pull the drive rotor tight against the feeler gauges (drive rotor, feeler gauges, and idler rotor must be tight against each other). While holding the drive rotor tight against the feeler gages rotate (in the direction that the rotor turns) the gear on the drive rotor until a tooth on it contacts a tooth on the gear on the idler rotor. Hand tighten the 7 capscrews in the drive gear locking assembly. Align and adjust the connection.
- I. Use a torque wrench to tighten the screws to 75 in. lbs in a diametrically opposite sequence. Ensure that none of the screws will turn when 75 in. lbs is applied to them a second time.
- J. Tighten the screws further to 150 in. lbs in a diametrically opposite sequence. Ensure that none of the screws will turn when 150 in. lbs is applied to them a second time.
- K. Check gear backlash four places at 90 degree intervals as described in the disassembly procedure (Item 4).

A CAUTION

These impeller-to-impeller and impeller-to-case clearances are extremely critical. Even though the blower may turn freely by hand when cold, under operating conditions, the parts expand, and the rotors are subject to slight defection.

If the clearances are not sufficient, the impellers may contact each other or the housing with destructive results. If the clearances are too great, the blower may not develop the pressure or airflow that is required to perform its function.

14. Impeller tip to case clearance should be checked at this time by inserting the correct thickness feeler gauge between the tip and the case and rotating the impeller (see FIGURE 7-4, page 34). Repeat the procedure on both impellers.

NOTICE

When checking the tip to case clearance, move the feeler gauge over the entire length of the impeller to ensure that the tips do not bind along their length.



FIGURE 7-8

NOTICE

Replacement gears have minimum backlash marks on the outside diameter of the gear face. These marks should be located 180 degrees from each other (see FIGURE 7-8).

NOTICE

The gear used for adjustment should be flush with its mate on completion of the timing.

NOTICE

If any of the four gear backlash readings are not within the specified limits, the gears must be replaced.

15. Replace drive shaft oil seal (31) in the drive end cover (29). The seal lip should always face towards the bearing or lubricant.

Grease Units

Pack bearing cavities with recommended grease and secure drive cover with socket head cap screws (30) to drive headplate.

Dual Splash Units

Install drive end gasket (7). Gently slide the drive end cover (29) over the drive shaft and tap cover down over dowel pins until flush. Install and tighten drive cover bolts (30).

Refer to FIGURE 7-9, for torque specifications.



Exercise care not to damage the seal lip as it passes over the shaft keyway.

- 16. Assemble the gear cover (3) and gasket (7) to the gear headplate (18) using socket head screw (5). Tighten the capscrews alternately and evenly. Refer to FIGURE 7-9 for torque specifications.
- 17. Place the blower on its feet on a flat surface. Loosen cap screws (16) and level the unit up. The bench or blower base flatness should be within .002 of an inch. Re-tighten cap screws (16) to the specification in FIGURE 7-9.

NOTICE

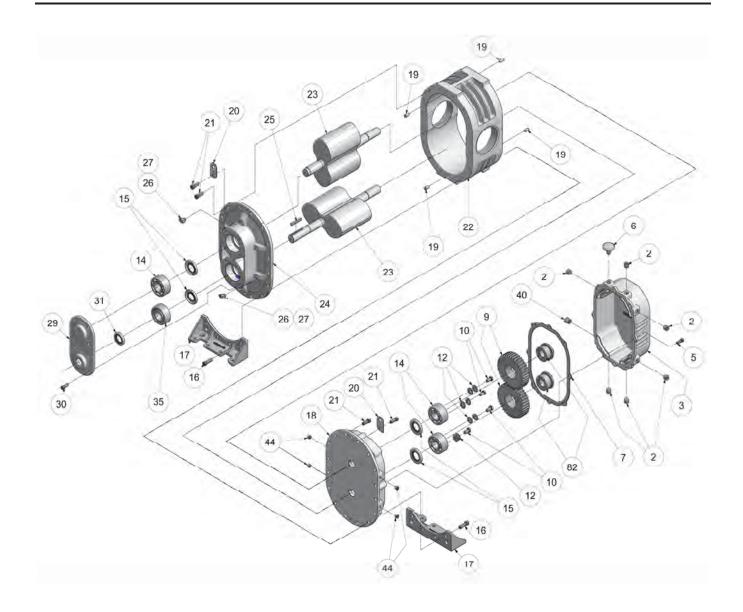
If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

	GEAR DIAMETER				
FASTENERS	3	4	5		
CAPSCREW (21)	23 – 30	42 – 45	42 – 45		
CAPSCREW (16)	23 – 30	42 – 45	42 – 45		
SOCKET HD CAPSCREW (5)	6 – 8	16 – 18	11 – 13		
SOCKET HD CAPSCREW (30)	6 – 8	16 – 18	11 – 13		
CAPSCREW (10)	6 – 8	38 – 42	38 – 42		

NOTE: () DENOTES ITEMS IN EXPLODED VIEW DRAWINGS ON PAGES 39 AND 43.

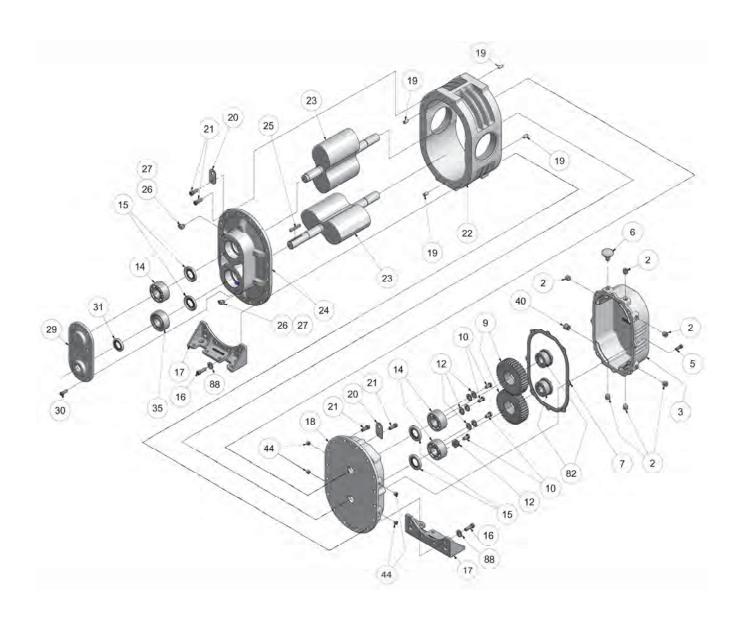
FIGURE 7-9 - TORQUE (FT-LBS)

SECTION 8 PARTS LIST



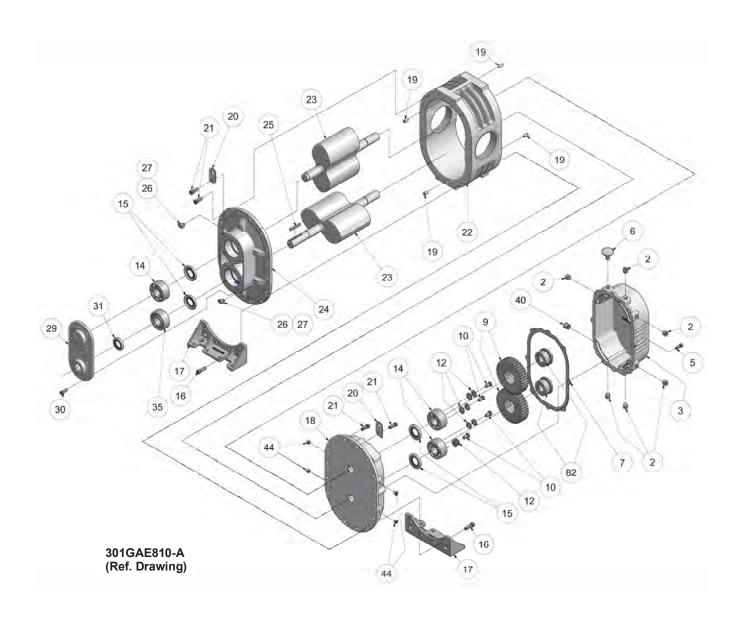
		Model GAB Lip Seal		Grease	Splash Lube	
I	Ref.	·	No.	Size - 3H	Size – 3M	Size 3L
	No.	Description	Req'd	GABH_R <u>∆</u> <u>∆= (A or C)</u>	GABM_R $\underline{\Delta}$ $\underline{\Delta}$ = (A or C)	GABL_R \triangle \triangle = (A or C)
	2	Plug		64AC2	64AC2	64AC2
	3	Gear Case		303GAB602	303GAB602	303GAB602
	5	Screw		75P7	75P7	75P7
	6	Breather		5L358	5L358	5L358
*	7	Gasket		300GAB715	300GAB715	300GAB715
	9	Gear Kit		300GAB6008	300GAB6008	300GAB6008
*	10	Screws		75A33P	75A33P	75A33P
	12	Washer		95A2	95A2	95A2
*	14	Ball Bearing		12BA143	12BA143	12BA143
*	15	Oil Seal		900891030601	900891030601	900891030601
	16	Screw		75P56	75P56	75P56
	17	Foot – Vert. & Horiz.	. 2	303GAB166	303GAB166	303GAB166
	18	Bearing Housing Gear End	. 1	302GAB006	302GAB006	302GAB006
	19	Dowel Pin	. 4	62M48	62M48	62M48
	20	Lifting Lug	. 2	200GAA451	200GAA451	200GAA451
	21	Screw	. 20	75P55	75P55	75P55
	22	Impeller Case	. 1	900873034301	900873033801	900873034201
	23	Rotor Group				
		3" Standard Clearances	. 1	307GAB4028	309GAB4028	308GAB4028
		3" High Temperature Clearances	. 1	To be assigned	To be assigned	To be assigned
	24	Bearing Housing Drive End	. 1	900873033501	900873033501	900873033501
	25	Key-Square	. 1	900639910304	900639910304	900639910304
	26	Pipe Fitting	. 2	40E9	40E9	40E9
	27	Сар	. 2	40P58	40P58	40P58
	29	Drive Cover	. 1	900873033701	900873033701	900873033701
	30	Screw	. 6	75P22	75P22	75P22
*	31	Oil Seal	. 1	60DD725	60DD725	60DD725
*	35	Bearing – Roller	. 1	12BA153	12BA153	12BA153
	40	Oil Level Gauge	. 1	40P82	40P82	40P82
	44	Screw	. 4	76F1	76F1	76F1
**	45	Paint, Bulk, GDP188, Aluminum	0.125	28H284	28H284	28H284
**	54	Shim Case .0025/.0035"	. 1	200GAB732	200GAB732	200GAB732
**	55	Shim Case .010"	. 1	201GAB732	201GAB732	201GAB732
**	56	Shim Case .0015/.002"	. 1	202GAB732	202GAB732	202GAB732
	82	Locking Assembly	. 2	22G45	22G45	22G45
**	105	Overhaul Kit 3" R VERS Lip Seal, Grease Splash Lube		302GAB6010	302GAB6010	302GAB6010
**	900	Group-Indent & Instruction Legend Series 3" R VERS	. 1	303GAB4011	303GAB4011	303GAB4011

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION.



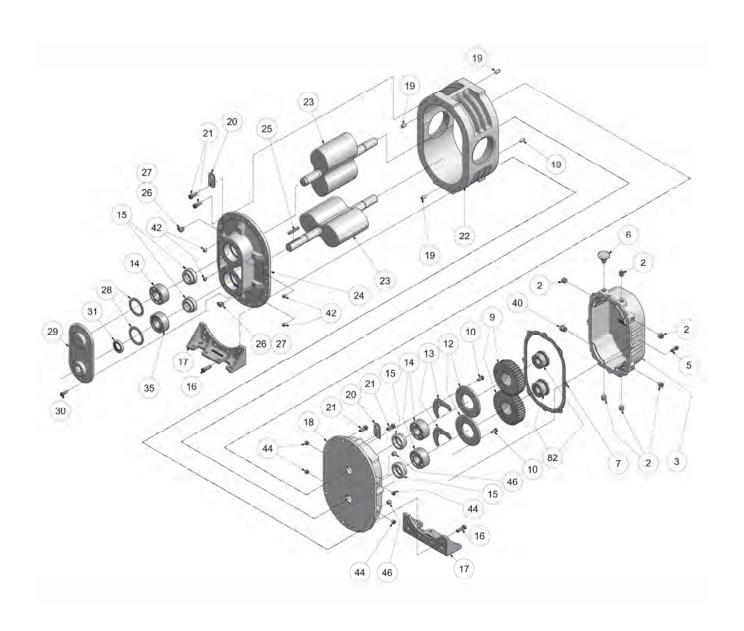
		Model GAC Lip Seal		Greas	e Splash Lub	е
R	Ref.	·	No.	Size – 4H	Size – 4M	Size 4L
N	No.	Description	Req'd	GACH_R \triangle \triangle = (A or C)	GACM_R \triangle \triangle = (A or C)	GACL_R \triangle \triangle = (A or C)
	2	Plug	6	64AC3	64AC3	64AC3
	3	Gear Case	1	304GAC602	304GAC602	304GAC602
	5	Screw	8	75P40	75P40	75P40
	6	Breather	1	5L359	5L359	5L359
*	7	Gasket	1	301GAC715	301GAC715	301GAC715
	9	Gear Kit	1	300GAC6008	300GAC6008	300GAC6008
*	10	Screws	4	655ED03P	655ED03P	655ED03P
	12	Washer	8	95A3	95A3	95A3
*	14	Ball Bearing	3	12BA144	12BA144	12BA144
*	15	Oil Seal	4	60DD630	60DD630	60DD630
	16	Screw	8	75P56	75P56	75P56
	17	Foot – Vert. & Horiz.	2	300GAC166	300GAC166	300GAC166
	18	Bearing Housing Gear End	1	302GAC006	302GAC006	302GAC006
	19	Dowel Pin	4	62M48	62M48	62M48
	20	Lifting Lug	2	200GAA451	200GAA451	200GAA451
	21	Screw	16	75P55	75P55	75P55
	22	Impeller Case	1	900883042201	900883041801	900883042001
	23	Rotor Group				
		4" Standard Clearances	1	307GAC4028	306GAC4028	305GAC4028
		4" High Temperature Clearances	1	To be assigned	To be assigned	To be assigned
	24	Bearing Housing Drive End	1	300GAC006	300GAC006	300GAC006
	25	Key-Square	1	900639910304	900639910304	900639910304
	26	Pipe Fitting	2	40E9	40E9	40E9
	27	Сар	2	40P58	40P58	40P58
	29	Drive Cover	1	900883040301	900883040301	900883040301
	30	Screw	8	75P189	75P189	75P189
*	31	Oil Seal	1	60DD716	60DD716	60DD716
*	35	Bearing – Roller	1	12BA154	12BA154	12BA154
	40	Oil Level Gauge	1	40P34	40P34	40P34
	44	Screw	4	76F1	76F1	76F1
**	45	Paint, Bulk, GDP188, Aluminum	0.125	28H284	28H284	28H284
**	54	Shim Case .0025/.0035"	1	200GAC732	200GAC732	200GAC732
**	55	Shim Case .010"	1	201GAC732	201GAC732	201GAC732
**	56	Shim Case .0015/.002"	1	202GAC732	202GAC732	202GAC732
	82	Locking Assembly	2	22G44	22G44	22G44
	88	Washer	4	95A3	95A3	95A3
**	105	Overhaul Kit 4" R VERS Lip Seal, Grease Splash Lube	1	300GAC6010	300GAC6010	300GAC6010
** (900	Group-Indent & Instruction Legend Series 4" R VERS	1	201GAC4011	201GAC4011	201GAC4011

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION.



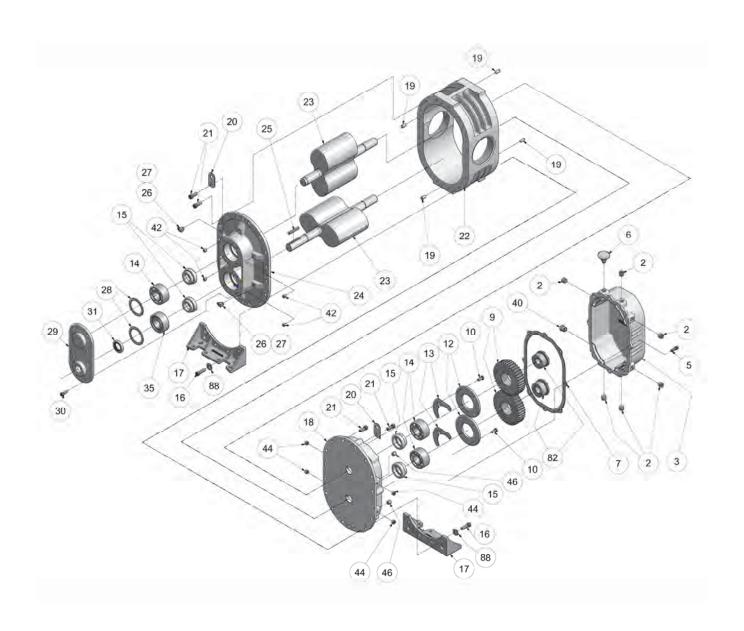
	Model GAE Lip Seal		Grease	Splash Lube)
Ref.	•	No.	Size – 5H	Size – 5M	Size 5L
No.	Description	Req'd	GAEH_R <u>∆</u> ∆= (A or C)	GAEM_R \triangle \triangle = (A or C)	GAEL_R \triangle \triangle = (A or C)
2	Plug		64AC3	64AC3	64AC3
3	Gear Case		304GAE602	304GAE602	304GAE602
5	Screw		75P40	75P40	75P40
6	Breather		5L359	5L359	5L359
* 7	Gasket		300GAE715	300GAE715	300GAE715
9	Gear Kit		300GAE6008	300GAE6008	300GAE6008
* 10	Screws		655ED03P	655ED03P	655ED03P
12	Washer		95A3	95A3	95A3
* 14	Ball Bearing		8500397	8500397	8500397
* 15	Oil Seal	4	60DD714	60DD714	60DD714
16	Screw		75P56	75P56	75P56
17	Foot – Vert. & Horiz.	2	300GAE166	300GAE166	300GAE166
18	Bearing Housing Gear End	1	301GAE006	301GAE006	301GAE006
19	Dowel Pin	4	62M48	62M48	62M48
20	Lifting Lug	2	200GAA451	200GAA451	200GAA451
21	Screw	24	75P55	75P55	75P55
22	Impeller Case	1	900883051701	900883051801	900883051901
23	Rotor Group				
	5" Standard Clearances	1	327GAE4028	326GAE4028	325GAE4028
	5" High Temperature Clearances	1	To be assigned	To be assigned	To be assigned
24	Bearing Housing Drive End	1	206GAE006	206GAE006	206GAE006
25	Key-Square	1	900639910305	900639910305	900639910305
26	Pipe Fitting	2	40E9	40E9	40E9
27	Cap	2	40P58	40P58	40P58
29	Drive Cover	1	900883050401	900883050401	900883050401
30	Screw	8	75P189	75P189	75P189
* 31	Oil Seal	1	60DD726	60DD726	60DD726
* 35	Bearing – Roller	1	12BA155	12BA155	12BA155
40	Oil Level Gauge		40P34	40P34	40P34
44	Screw		76F92	76F92	76F92
** 45	Paint, Bulk, GDP188, Aluminum		28H284	28H284	28H284
** 54	Shim Case .0025/.0035"		200GAE732	200GAE732	200GAE732
** 55	Shim Case .010"		201GAE732	201GAE732	201GAE732
** 56	Shim Case .0015/.002"		202GAE732	202GAE732	202GAE732
82	Locking Assembly		22G43	22G43	22G43
** 105	Overhaul Kit 5" R VERS Lip Seal, Grease Splash Lube		300GAE6010	300GAE6010	300GAE6010
** 900	Group-Indent & Instruction Legend Series 5" R VERS		205GAE4011	205GAE4011	205GAE4011
	- 1				

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION.



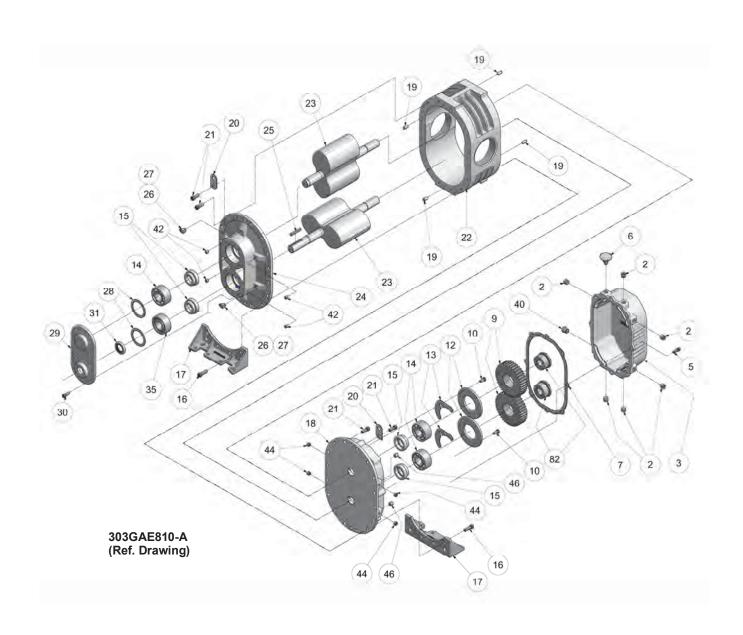
R	lef.	Model GAB Mech	anical Seal	No.	Grease Size – 3H	Splash Lube Size – 3M	Size 3L
N	lo.	Description	Re	eq'd	GABH_RB	GABM_RB	GABL_RB
	2	Plug		6	64AC2	64AC2	64AC2
	3	Gear Case		1	303GAB602	303GAB602	303GAB602
	5	Screw		8	75P7	75P7	75P7
	6	Breather		1	5L358	5L358	5L358
*	7	Gasket		1	300GAB715	300GAB715	300GAB715
	9	Gear Kit		1	300GAB6008	300GAB6008	300GAB6008
*	10	Screws		4	75A33P	75A33P	75A33P
	12	Bearing Retainer		2	300GAB205	300GAB205	300GAB205
*	13	Shim Set		1	900881032200	900881032200	900881032200
*	14	Ball Bearing		3	12BA143	12BA143	12BA143
*	15	Mechanical Seal		4	900871020003	900871020003	900871020003
	16	Screw		4	75P56	75P56	75P56
	17	Foot – Vert. & Horiz		2	303GAB166	303GAB166	303GAB166
	18	Bearing Housing Gear End		1	304GAB006	304GAB006	304GAB006
	19	Dowel Pin		4	62M48	62M48	62M48
	20	Lifting Lug		2	200GAA451	200GAA451	200GAA451
	21	Screw		20	75P55	75P55	75P55
	22	Impeller Case		1	900873034301	900873033801	900873034201
	23	Rotor Group					
		3" Standard Clearances		1	307GAB4028	309GAB4028	308GAB4028
		3" High Temperature Clearances		1	To be assigned	To be assigned	To be assigned
	24	Bearing Housing Drive End		1	900883030301	900883030301	900883030301
	25	Key-Square		1	900639910304	900639910304	900639910304
	26	Pipe Fitting		2	40E9	40E9	40E9
	27	Сар		2	40P58	40P58	40P58
*	28	Wavy Spring		2	900669170203	900669170203	900669170203
	29	Drive Cover		1	900873033701	900873033701	900873033701
	30	Screw		6	75P22	75P22	75P22
*	31	Oil Seal		1	60DD725	60DD725	60DD725
*	35	Bearing – Roller		1	12BA153	12BA153	12BA153
	40	Oil Level Gauge		1	40P82	40P82	40P82
	42	Plug		4	64AC1	64AC1	64AC1
	44	Screw		4	76F1	76F1	76F1
**	45	Paint, Bulk, GDP188, Aluminum	0.	.125	28H284	28H284	28H284
	46	Plug		4	64AC1	64AC1	64AC1
**	54	Shim Case .0025/.0035"		1	200GAB732	200GAB732	200GAB732
**	55	Shim Case .010"		1	201GAB732	201GAB732	201GAB732
**	56	Shim Case .0015/.002"		1	202GAB732	202GAB732	202GAB732
	82	Locking Assembly		2	22G45	22G45	22G45
**	105	Overhaul Kit 3" R VERS Mechanical Seal, Gr		1	303GAB6010	303GAB6010	303GAB6010
**	900	Group-Indent & Instruction Legend Series 3"	R VERS	1	303GAB4011	303GAB4011	303GAB4011

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION



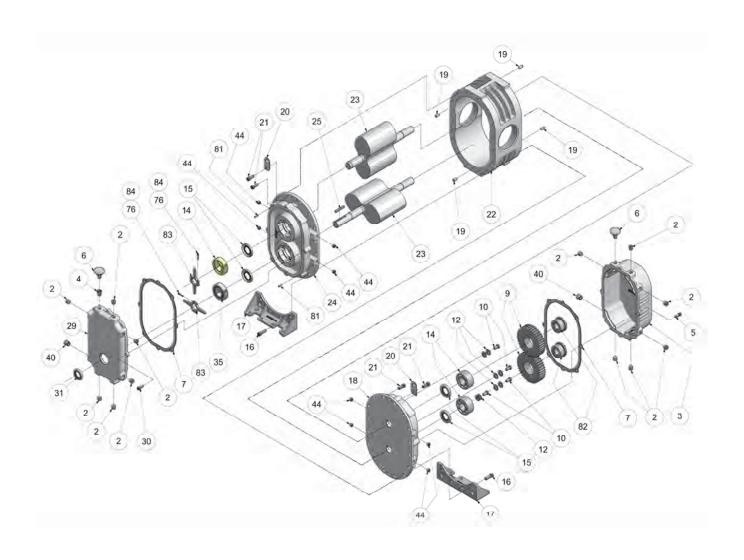
Ref.	Model GAC Mo	echanical Seal	No.	Grease S Size – 4H	plash Lube Size – 4M	Size 4L
No.	Description		Req'd	GACH_RB	GACM_RB	GACL_RB
				OACII_KB	GACIII_IND	GACE_ND
2	Plug		6	64AC3	64AC3	64AC3
3	Gear Case		1	304GAC602	304GAC602	304GAC602
5	Screw		8	75P40	75P40	75P40
6	Breather		1	5L359	5L359	5L359
* 7	Gasket		1	301GAC715	301GAC715	301GAC715
9	Gear Kit		1	300GAC6008	300GAC6008	300GAC6008
* 10	Screws		8	75A33P	75A33P	75A33P
12	Bearing Retainer		2	900883040201	900883040201	900883040201
* 13	Shim Set		1	900881042900	900881042900	900881042900
* 14	Ball Bearing		3	12BA144	12BA144	12BA144
* 15	Mechanical Seal		4	900871020004	900871020004	900871020004
16	Screw		8	75P56	75P56	75P56
17	Foot – Vert. & Horiz.		2	300GAC166	300GAC166	300GAC166
18	Bearing Housing Gear End		1	304GAC006	304GAC006	304GAC006
19	Dowel Pin		4	62M48	62M48	62M48
20	Lifting Lug		2	200GAA451	200GAA451	200GAA451
21	Screw		16	75P55	75P55	75P55
22	Impeller Case		1	900883042201	900883041801	900883042001
23	Rotor Group					
	4" Standard Clearances		1	307GAC4028	306GAC4028	305GAC4028
	4" High Temperature Clearances		1	To be assigned	To be assigned	To be assigned
24	Bearing Housing Drive End		1	900883041201	900883041201	900883041201
25	Key-Square		1	900639910304	900639910304	900639910304
26	Pipe Fitting		2	40E9	40E9	40E9
27	Cap		2	40P58	40P58	40P58
* 28	Wavy Spring		2	900669170304	900669170304	900669170304
29	Drive Cover		1	900883040301	900883040301	900883040301
30	Screw		8	75P189	75P189	75P189
* 31	Oil Seal		1	60DD716	60DD716	60DD716
* 35	Bearing – Roller		1	12BA154	12BA154	12BA154
40	Oil Level Gauge		1	40P34	40P34	40P34
42	Plug		4	64AC1	64AC1	64AC1
44	Screw		4	76F1	76F1	76F1
** 45	Paint, Bulk, GDP188, Aluminum		0.125	28H284	28H284	28H284
46	Plug		4	64AC1	64AC1	64AC1
** 54	Shim Case .0025/.0035"		1	200GAC732	200GAC732	200GAC732
** 55	Shim Case .010"		1	201GAC732	201GAC732	201GAC732
** 56	Shim Case .0015/.002"		1	202GAC732	202GAC732	202GAC732
82	Locking Assembly		2	22G44	22G44	22G44
88	Washer		4	95A3	95A3	95A3
** 105	Overhaul Kit 4" R VERS Mechanical Se	eal, Grease Splash Lube	1	302GAC6010	302GAC6010	302GAC6010
** 900	Group-Indent & Instruction Legend Ser	ries 4" R VERS	1	201GAC4011	201GAC4011	201GAC4011

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION



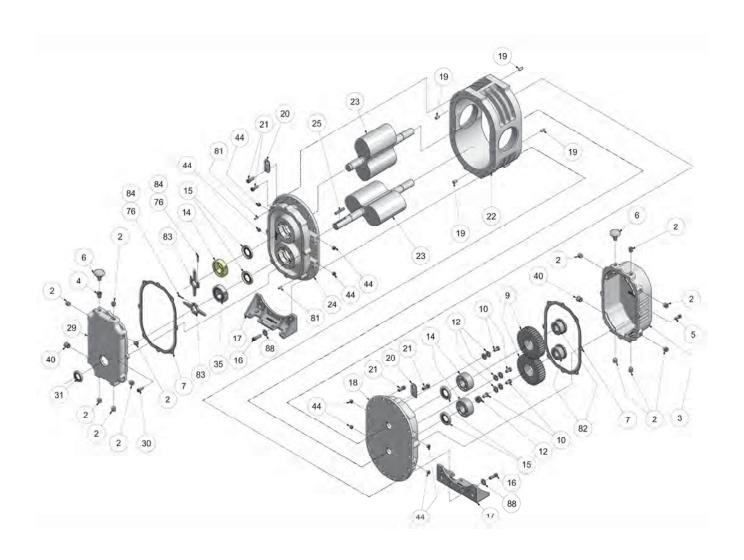
R	ef.	Model GAE Mechanical S	Seal No.		se Splash Lub Size – 5M	e Size 5L
N	lo.	Description	Req'	d GAEH_RB	GAEM_RB	GAEL_RB
	_		2	044.00	244.00	044.00
	2	Plug		64AC3	64AC3	64AC3
	3	Gear Case		304GAE602	304GAE602	304GAE602
	5	Screw		75P40	75P40	75P40
	6	Breather		5L359	5L359	5L359
*	7	Gasket		300GAE715	300GAE715	300GAE715
	9	Gear Kit		300GAE6008	300GAE6008	300GAE6008
*	10	Screws		75A33P	75A33P	75A33P
	12	Bearing Retainer		900883050501	900883050501	900883050501
*	13	Shim Set		900881052900	900881052900	900881052900
*	14	Ball Bearing		8500397	8500397	8500397
*	15	Mechanical Seal	4	900871020005	900871020005	900871020005
	16	Screw		75P56	75P56	75P56
	17	Foot – Vert. & Horiz.		300GAE166	300GAE166	300GAE166
	18	Bearing Housing Gear End	1	303GAE006	303GAE006	303GAE006
	19	Dowel Pin	4	62M48	62M48	62M48
	20	Lifting Lug	2	200GAA451	200GAA451	200GAA451
	21	Screw	24	75P55	75P55	75P55
	22	Impeller Case	1	900883051701	900883051801	900883051901
	23	Rotor Group				
		5" Standard Clearances	1	327GAE4028	326GAE4028	325GAE4028
		5" High Temperature Clearances	1	To be assigned	To be assigned	To be assigned
	24	Bearing Housing Drive End	1	207GAE006	207GAE006	207GAE006
	25	Key-Square	1	900639910305	900639910305	900639910305
	26	Pipe Fitting	2	40E9	40E9	40E9
	27	Cap	2	40P58	40P58	40P58
*	28	Wavy Spring	2	900669170405	900669170405	900669170405
	29	Drive Cover	1	900883050401	900883050401	900883050401
	30	Screw	8	75P189	75P189	75P189
*	31	Oil Seal	1	60DD726	60DD726	60DD726
*	35	Bearing – Roller	1	12BA155	12BA155	12BA155
	40	Oil Level Gauge	1	40P34	40P34	40P34
	42	Plug	4	64AC1	64AC1	64AC1
	44	Screw	4	76F92	76F92	76F92
**	45	Paint, Bulk, GDP188, Aluminum	0.125	5 28H284	28H284	28H284
	46	Plug	4	64AC2	64AC2	64AC2
**	54	Shim Case .0025/.0035"		200GAE732	200GAE732	200GAE732
**	55	Shim Case .010"		201GAE732	201GAE732	201GAE732
**	56	Shim Case .0015/.002"		202GAE732	202GAE732	202GAE732
	82	Locking Assembly		22G43	22G43	22G43
**	105	Overhaul Kit 5" R VERS Mechanical Seal, Grease Sp		302GAE6010	302GAE6010	302GAE6010
	900	Group-Indent & Instruction Legend Series 5" R VERS	•	205GAE4011	205GAE4011	205GAE4011

^{*} INCLUDED IN OVERHAUL KIT.
** NOT SHOWN ON ILLUSTRATION



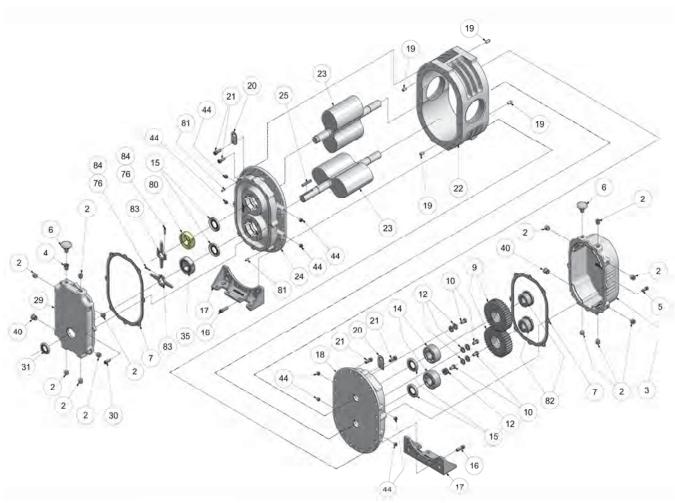
	Model GAB Li	p Seal		Dual	Splash Lube	
Ref.			No.	Size – 3H	Size – 3M	Size 3L
No.	Description		Req'd	GABH_R \triangle \triangle = (D or F)	GABM_R \triangle \triangle = (D or F)	GABL_R \triangle \triangle = (D or F)
2	Plug		12	64AC2	64AC2	64AC2
3	Gear Case		1	303GAB602	303GAB602	303GAB602
5	Screw		8	75P7	75P7	75P7
6	Breather		2	5L358	5L358	5L358
* 7	Gasket		2	300GAB715	300GAB715	300GAB715
9	Gear Kit		1	300GAB6008	300GAB6008	300GAB6008
* 10	Screws		4	75A33P	75A33P	75A33P
12	Washer		8	95A2	95A2	95A2
* 14	Ball Bearing		3	12BA143	12BA143	12BA143
* 15	Oil Seal		4	900891030601	900891030601	900891030601
16	Screw		4	75P56	75P56	75P56
17	Foot – Vert. & Horiz.		2	303GAB166	303GAB166	303GAB166
18	Bearing Housing Gear End		1	302GAB006	302GAB006	302GAB006
19	Dowel Pin		4	62M48	62M48	62M48
20	Lifting Lug		2	200GAA451	200GAA451	200GAA451
21	Screw		20	75P55	75P55	75P55
22	Impeller Case		1	900873034301	900873033801	900873034201
23	Rotor Group		•	000070001001	00007000001	000070001201
20	3" Standard Clearances		1	307GAB4028	309GAB4028	308GAB4028
	3" High Temperature Clearances		1	To be assigned	To be assigned	To be assigned
24	Bearing Housing Drive End		1	303GAB006	303GAB006	303GAB006
25	Key-Square		1	900639910304	900639910304	900639910304
29	Drive Cover		1	302GAB477	302GAB477	302GAB477
30	Screw		8	75P7	75P7	75P7
* 31	Oil Seal		1	60DD725	60DD725	60DD725
* 35	Bearing – Spherical		1	12BA153	12BA153	12BA153
40	Oil Level Gauge		2	40P82	40P82	40P82
44	Screw		8	76F1	76F1	76F1
** 45	Paint, Bulk, GDP188, Aluminum		_	28H284	28H284	28H284
** 54	Shim Case .0025/.0035"		1	200GAB732	200GAB732	200GAB732
** 55	Shim Case .0010"		1	201GAB732	201GAB732	201GAB732
** 56	Shim Case .0015/.002"		1	202GAB732	202GAB732	202GAB732
76	Compound, Loctite		50	25BC877	25BC877	25BC877
81	Dowel Pin		2	62M13	62M13	62M13
82	Locking Assembly		2	22G45	22G45	22G45
83	Slinger		2	300GAB173	300GAB173	300GAB173
84	Screw		2	75LM13	75LM13	75LM13
** 105	Overhaul Kit 3" R VERS Lip Seal, Dual		1	301GAB6010	301GAB6010	301GAB6010
** 900	Group-Indent & Instruction Legend Serie		1	303GAB4011	303GAB4011	303GAB4011
300	Group-indent & matruction Legend Sent		1	0000AD4011	000GAD4011	000GAD4011

^{*} INCLUDED IN OVERHAUL KIT.
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		Model GAC Lip Seal		Dual Splash Lube		
R	ef.	др. сод.	No.	Size – 4H	Size – 4M	Size 4L
				GACH_R ∆	$GACM_R \Delta$	GACL_R ∆
N	lo.	Description	Req'd	Δ = (D or F)	Δ = (D or F)	Δ = (D or F)
	2	Dlug	12	64AC3	64AC3	64AC3
	3	Plug Gear Case		304GAC602	304GAC602	304GAC602
	5	Screw	-	75P40	75P40	75P40
	6	Breather				
*	7			5L359	5L359 301GAC715	5L359 301GAC715
	9	Gasket		301GAC715 300GAC6008	300GAC6008	300GAC6008
*	-	Gear Kit	=			
	10	Screws		655ED03P	655ED03P	655ED03P
*	12	Washer		95A3	95A3	95A3
*	14	Ball Bearing		12BA144	12BA144	12BA144
	15	Oil Seal		60DD630	60DD630	60DD630
	16	Screw	•	75P56	75P56	75P56
	17	Foot – Vert. & Horiz.		300GAC166	300GAC166	300GAC166
	18	Bearing Housing Gear End		302GAC006	302GAC006	302GAC006
	19	Dowel Pin		62M48	62M48	62M48
	20	Lifting Lug		200GAA451	200GAA451	200GAA451
	21	Screw		75P55	75P55	75P55
	22	Impeller Case	1	900883042201	900883041801	900883042001
	23	Rotor Group				
		4" Standard Clearances		307GAC4028	306GAC4028	305GAC4028
		4" High Temperature Clearances		To be assigned	To be assigned	To be assigned
	24	Bearing Housing Drive End		303GAC006	303GAC006	303GAC006
	25	Key-Square		900639910304	900639910304	900639910304
	29	Drive Cover		302GAC477	302GAC477	302GAC477
	30	Screw		75P40	75P40	75P40
*	31	Oil Seal		60DD716	60DD716	60DD716
*	35	Bearing – Spherical		12BA255	12BA255	12BA255
	40	Oil Level Gauge		40P34	40P34	40P34
	44	Screw		76F1	76F1	76F1
	45	Paint, Bulk, GDP188, Aluminum		28H284	28H284	28H284
**	54	Shim Case .0025/.0035"		200GAC732	200GAC732	200GAC732
**	56	Shim Case .0015/.002"		202GAC732	202GAC732	202GAC732
	76	Compound, Loctite		25BC877	25BC877	25BC877
	81	Dowel Pin		62M13	62M13	62M13
	82	Locking Assembly		22G44	22G44	22G44
	83	Slinger		300GAC173	300GAC173	300GAC173
	84	Screw	_	75LM14	75LM14	75LM14
	88	Washer	-	95A3	95A3	95A3
	05	Overhaul Kit 4" R VERS Lip Seal, Dual Splash Lube		301GAC6010	301GAC6010	301GAC6010
** 9	900	Group-Indent & Instruction Legend Series 4" R VERS	1	201GAC4011	201GAC4011	201GAC4011

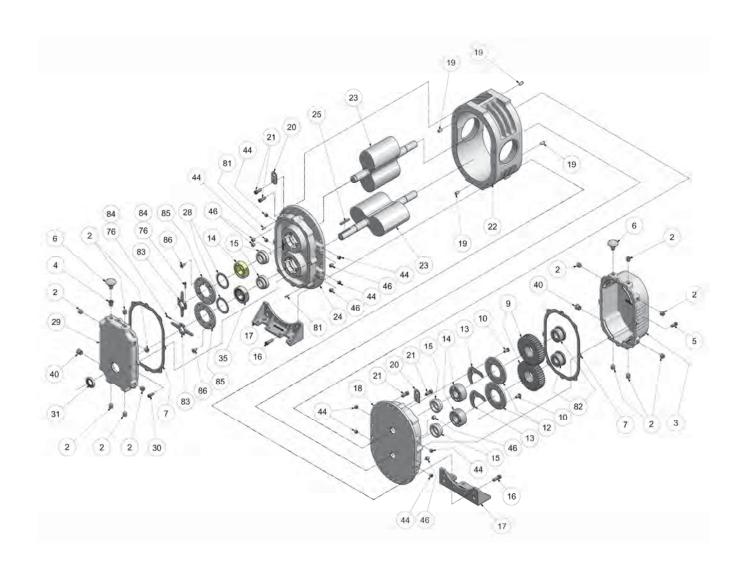
^{*} INCLUDED IN OVERHAUL KIT.
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300GAE810-A (Ref. Drawing)

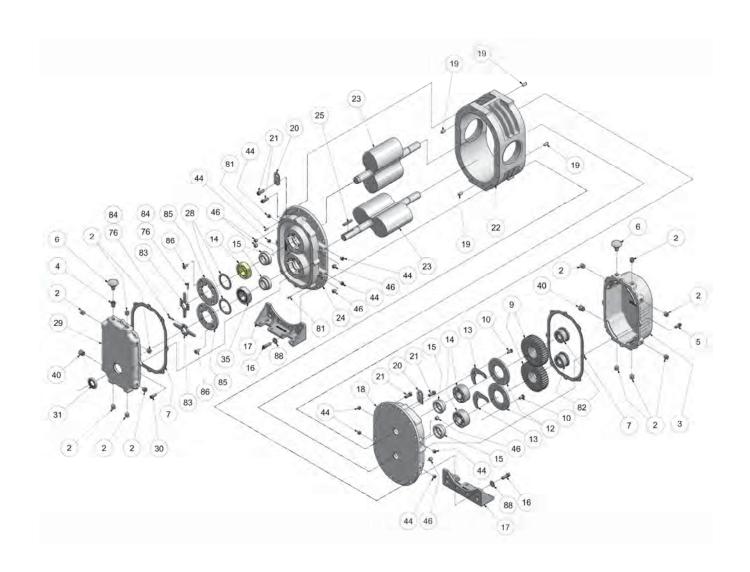
		Model GAE Lip Seal			Dua	al Splash Lube	
F	Ref.			No.	Size – 5H	Size - 5M	Size 5L
		Book didden		D 1.1	GAEH_R <u>∆</u>	GAEM_R <u>∆</u>	GAEL_R <u>∆</u>
	No.	Description		Req'd	$\Delta = (D \text{ or } F)$	Δ = (D or F)	$\Delta = (D \text{ or } F)$
	2	Plug		12	64AC3	64AC3	64AC3
	3	Gear Case		1	304GAE602	304GAE602	304GAE602
	5	Screw		8	75P40	75P40	75P40
	6	Breather		2	5L359	5L359	5L359
*	7	Gasket		2	300GAE715	300GAE715	300GAE715
	9	Gasket		1	300GAE713	300GAE713	300GAE6008
*	10	Screws		4	655ED03P	655ED03P	655ED03P
	12	Washer		8	95A3	95A3	95A3
*	14	Ball Bearing		2	8500397	8500397	8500397
*	15	Oil Seal		4	60DD714	60DD714	60DD714
	16			8	75P56	75P56	75P56
	17	ScrewFoot – Vert. & Horiz		2			
	18			1	300GAE166	300GAE166	300GAE166
	19	Bearing Housing Gear End		4	301GAE006 62M48	301GAE006 62M48	301GAE006 62M48
		Dowel Pin		2			
	20 21	Lifting Lug		24	200GAA451 75P55	200GAA451 75P55	200GAA451 75P55
		Screw					
	22 23	Impeller Case		1	900883051701	900883051801	900883051901
	23	Rotor Group 5" Standard Clearances		1	327GAE4028	326GAE4028	325GAE4028
				1			
	25	5" High Temperature Clearances		1	To be assigned 900639910305	To be assigned 900639910305	To be assigned 900639910305
	29	Key-Square Drive Cover		1	300GAE477	300GAE477	
				1 8			300GAE477
*	30	Screw		•	75P40	75P40	75P40
*	31 35	Oil Seal		1 1	60DD726 12BA253	60DD726 12BA253	60DD726 12BA253
	35 40	Bearing – Spherical		2			12BA253 40P34
	40	Oil Level Gauge		8	40P34 76F92	40P34 76F92	76F92
**		Screw		-			
**	45 54	Paint, Bulk, GDP188, AluminumShim Case .0025/.0035"			28H284	28H284	28H284
**				1	200GAE732	200GAE732	200GAE732
**	55 56	Shim Case .010"		1	201GAE732	201GAE732	201GAE732
	56	Shim Case .0015/.002"		1	202GAE732	202GAE732	202GAE732
*	76	Compound, Loctite		5	25BC877	25BC877	25BC877
	80	Bearing – Conrad		1	12BA254	12BA254	12BA254
	81	Dowel Pin		2	62M13	62M13	62M13
	82	Locking Assembly		2	22G43	22G43	22G43
	83	Slinger		2	300GAE173	300GAE173	300GAE173
**	84	Screw		2	75LM14	75LM14	75LM14
	105	Overhaul Kit 5" R VERS Lip Seal, Dual Splash I		1	301GAE6010	301GAE6010	301GAE6010
** (900	Group-Indent & Instruction Legend Series 5" R VE	KS	1	205GAE4011	205GAE4011	205GAE4011

^{*} INCLUDED IN OVERHAUL KIT.
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Ref.	Model GAB Mechanical S	eal No.	Du Size – 3H	al Splash Lube Size – 3M) Size 3L
	Providence		GABH_R <u>∆</u>	GABM_R <u>∆</u>	GABL_R <u>∆</u>
No.	Description	Req'd	Δ = (E or G)	Δ = (E or G)	Δ = (E or G)
2	Dlug	12	64AC2	64AC2	64AC2
3	Plug Gear Case		303GAB602	303GAB602	303GAB602
5 5					
-	Screw		75P7	75P7	75P7
6 * 7	Breather		5L358	5L358	5L358
1	Gasket		300GAB715	300GAB715	300GAB715
9 * 10	Gear Kit		300GAB6008	300GAB6008	300GAB6008
10	Screws		75A33P	75A33P	75A33P
12	Bearing Retainer		300GAB205	300GAB205	300GAB205
* 13	Shim Set		900881032200	900881032200	900881032200
* 14	Ball Bearing		12BA143	12BA143	12BA143
* 15	Mechanical Seal		900871020003	900871020003	900871020003
16	Screw		75P56	75P56	75P56
17	Foot – Vert. & Horiz.		303GAB166	303GAB166	303GAB166
18	Bearing Housing Gear End	1	304GAB006	304GAB006	304GAB006
19	Dowel Pin	4	62M48	62M48	62M48
20	Lifting Lug	2	200GAA451	200GAA451	200GAA451
21	Screw	20	75P55	75P55	75P55
22	Impeller Case	1	900873034301	900873033801	900873034201
23	Rotor Group				
	3" Standard Clearances	1	307GAB4028	309GAB4028	308GAB4028
	3" High Temperature Clearances		To be assigned	To be assigned	To be assigned
24	Bearing Housing Drive End		305GAB006	305GAB006	305GAB006
25	Key-Square		900639910304	900639910304	900639910304
* 28	Wavy Spring		900669170203	900669170203	900669170203
29	Drive Cover		302GAB477	302GAB477	302GAB477
30	Screw		75P7	75P7	75P7
* 31	Oil Seal		60DD725	60DD725	60DD725
* 35	Bearing – Spherical		12BA153	12BA153	12BA153
40	Oil Level Gauge		40P82	40P82	40P82
44	Screw		76F1	76F1	76F1
** 45	Paint, Bulk, GDP188, Aluminum		28H284	28H284	28H284
46	Plug		64AC1	64AC1	64AC1
** 54	Shim Case .0025/.0035"		200GAB732	200GAB732	200GAB732
** 55	Shim Case .0020/.0003		201GAB732	201GAB732 201GAB732	201GAB732
** 56	Shim Case .010		202GAB732	201GAB732 202GAB732	202GAB732
76	Compound, Loctite		25BC877	25BC877	25BC877
81	Dowel Pin		62M13	62M13	62M13
82	Locking Assembly		22G45	22G45	22G45
83	Slinger	_	300GAB173	300GAB173	300GAB173
84	Screw		75LM13	75LM13	75LM13
85	Bearing Retainer	_	300GAB205	300GAB205	300GAB205
86	Screw		75LM214	75LM214	75LM214
** 105	Overhaul Kit 3" R VERS Mechanical Seal Dual, Splas		304GAB6010	304GAB6010	304GAB6010
** 900	Group-Indent & Instruction Legend Series 3" R VERS	5 1	303GAB4011	303GAB4011	303GAB4011

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** NOT SHOWN ON ILLUSTRATION



Ref.		chanical Seal	Du Size – 4H	al Splash Lube Size – 4M) Size 4L
Kei		NO.		GACM_R <u>∆</u>	GACL R A
No.	Description	Req'd	GACH_R <u>∆</u> <u>∆= (E or G)</u>	$\Delta = (E \text{ or } G)$	Δ = (E or G)
2	Plug		64AC3	64AC3	64AC3
3	Gear Case	1	304GAC602	304GAC602	304GAC602
5	Screw	8	75P40	75P40	75P40
6	Breather	2	5L359	5L359	5L359
* 7	Gasket	2	301GAC715	301GAC715	301GAC715
9	Gear Kit	1	300GAC6008	300GAC6008	300GAC6008
* 10	Screws	8	75A33P	75A33P	75A33P
12	Bearing Retainer	2	900883040201	900883040201	900883040201
* 13	Shim Set	1	900881052900	900881052900	900881052900
* 14	Ball Bearing	3	12BA144	12BA144	12BA144
* 15	Mechanical Seal	4	900871020004	900871020004	900871020004
16	Screw	8	75P56	75P56	75P56
17	Foot – Vert. & Horiz	2	300GAC166	300GAC166	300GAC166
18			304GAC006	304GAC006	304GAC006
19			62M48	62M48	62M48
20			200GAA451	200GAA451	200GAA451
2			75P55	75P55	75P55
22			900883042201	900883041801	900883042001
23	•				
	4" Standard Clearances	1	307GAC4028	306GAC4028	305GAC4028
	4" High Temperature Clearances		To be assigned	To be assigned	To be assigned
24			305GAC006	305GAC006	305GAC006
_ 25			900639910304	900639910304	900639910304
* 28	,		900669170304	900669170304	900669170304
29	, , 3		302GAC477	302GAC477	302GAC477
30			75P40	75P40	75P40
* 3		•	60DD716	60DD716	60DD716
* 35			12BA255	12BA255	12BA255
40	0 ,		40P34	40P34	40P34
44	•		76F1	76F1	76F1
** 45			28H284	28H284	28H284
46			64AC1	64AC1	64AC1
** 54	9		200GAC732	200GAC732	200GAC732
** 56			202GAC732	202GAC732	202GAC732
76			25BC877	25BC877	25BC877
8	•		62M13	62M13	62M13
82			22G44	22G44	22G44
83	•		300GAC173	300GAC173	300GAC173
84	•		75LM14	75LM14	75LM14
85			300GAC205	300GAC205	
					300GAC205 75LM214
86			75LM214	75LM214	
88 ** 105			95A3	95A3	95A3
** 900		•	303GAC6010	303GAC6010 201GAC4011	303GAC6010
900	Group-Indent & Instruction Legend Serie	es 4" R VERS 1	201GAC4011	2010A04011	201GAC4011

INCLUDED IN OVERHAUL KIT.
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